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A.E.C. Sman

ANNUAL
OF THE
UNIVERSAL MEDICAL SCIENCES

A YEARLY REPORT OF THE PROGRESS OF THE GENERAL
SANITARY SCIENCES THROUGHOUT THE WORLD.

EDITED BY

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ASSISTED BY

OVER TWO HUNDRED CORRESPONDING EDITORS, COLLABORATORS,
AND CORRESPONDENTS.

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VOLUME I.



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PREFACE.

IN presenting the second issue of the *ANNUAL* to the medical profession, to whose generous support its remarkable success is due, the editor wishes to state that, profiting by the suggestions of the patrons of the work, carefully gathered through the publishing department, he has been able to introduce several new features of importance. The first of these is calculated to greatly facilitate research. To each reference has been added the date, number, or volume of the journal quoted. Each periodical referred to directly, indirectly, or through the corresponding staff is represented by a number in the list at the end of the work, and this number is used in the text whenever the journal is quoted. By a system of double-checking each reference has been verified and everything done to make this feature of the work as perfect as practicable. The second addition is made for the especial benefit of those members of the profession who are not familiar with the foreign weights, measures, and thermometric systems. Grammes have been reduced to ounces, drachms, grains, etc., and Centigrade and Réaumur thermometric measurements to that of Fahrenheit, both systems appearing side by side. Owing to the large foreign circulation which the *ANNUAL* enjoys, counter-reductions have also been made to render perusal of the work by our foreign friends more agreeable to them. The third innovation consists of a complete and compact index to each volume, in addition to the full triple index of the entire work at the end of the last volume, as given in the issue of 1888.

In introducing these changes, the editor is but carrying out the original programme of the undertaking. While the general plan of the work is to present, as our distinguished

contemporary, the *St. Louis Weekly Medical Review*, gracefully expresses it, "not all, but the best of all, . . . avenues of thought, rather than a wild forest of good, bad, and indifferent," it will be governed, as to detail, by the requirements of the profession at large, whom it is destined to assist.

The editor wishes again to express his gratitude to the associate editors for the admirable manner in which they have acquitted themselves of their arduous tasks. Thanks to their kindly interest in the work and their readiness to co-operate in enabling it to attain the degree of perfection to which it aims, marked improvement is shown this year, not only in the uniformity of the articles, but in their practical usefulness to the physician.

To the corresponding editors and collaborators much is also due. A large increase in the number of reports, and their better adaptability to the requirements of the work, have greatly increased their usefulness. In the list of corresponding editors presented (with the exception of a few who have but recently been appointed) only the names of those appear who, since their appointment, have forwarded reports.

It becomes the editor's sorrowful duty to record the demise of two members of the editorial staff, Dr. Edward T. Bruen, of Philadelphia, associate editor, and Dr. J. Milner Fothergill, of London, corresponding editor. The high professional attainments and the many endearing qualities of Dr. Bruen have caused his loss to be keenly felt by his many associates and friends. Dr. Fothergill, one of the most active supporters of the *ANNUAL* abroad, had earned a well-merited eminence by his captivating pen, which won for him many warm admirers, even among those who knew him only by his works.

The editor does not wish to close without expressing his indebtedness to the medical press. In the beginning its

friendly feeling was a source of great encouragement. On its appearance the ANNUAL received at the hands of its contemporaries a welcome seldom equaled, and giving evidence on every side of the highest generosity.

The publishers of the ANNUAL, in renewing their efforts to assist the editor in every manner, have again placed him under deep obligation to them. Their liberality in other directions is shown by the mechanical production of the work. If "the cost of labor has been prodigious—up to the hilt of the indefatigable Dominie Sampson himself," "everything that money could do has been done." (*London Asclepiad.*)

Owing to want of room in the first volume, it became necessary to place Dr. F. P. Henry's valuable article on Diseases of the Blood in the fourth volume.

The editor wishes to state also that through an oversight proper credit was not given to Drs. W. H. Wilder, H. L. Taylor, and E. S. McKee, of Cincinnati, who assisted Dr. Whittaker in the preparation of the chapter on Bronchitis.

THE EDITOR.

PHILADELPHIA,
April 12, 1889.

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DISEASES OF THE LUNGS.

By JAMES T. WHITTAKER, M.D.,
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TUBERCULOSIS.

Etiology.—The bacillus tuberculosis, the one fixed fact in the pathology of the disease, is now universally regarded as the acknowledged centre about which all the phenomena of the disease must revolve. Thus, the etiology of tuberculosis is the life-history and habits of the tubercle bacillus, including the conditions most favorable or unfavorable for its reproduction and growth in the body; its symptomatology, the effect it produces in the body. The definite diagnosis is the recognition of the bacillus in the discharges or tissues, and the therapy the use of the agents which will destroy it, or will render the soil of its selection infertile for its growth. Whatever views, theories, or hypotheses will not fit in with this fact are relegated as obsolete lumber to chapters on the history of the disease.

Invasion by Inheritance.—The first question in etiology in point of time and one of the first in importance is the question of heredity or hereditary transmission of the disease. The older writers felt no hesitation in assuming a direct transmission of tuberculosis from parent to child. The very fact that the offspring of tuberculous parents were most frequently affected with the disease was sufficient proof of the rôle of heredity. The question with them was merely a question of percentage. Statistics in this connection varied according to the range of ancestry or relationship included in the list. Thus, according to Williams,¹⁰⁰⁷ of one thousand and ten cases of the Brompton Hospital report, which included only parents, the influence of heredity gave an average of 24.4 per cent., while Pollock's one thousand and two hundred cases, which included parents, brothers, and sisters, furnished 30 per cent., Cotton's one thousand cases, with the same range, 36.7 per cent., and Fuller's three hundred and eighty-five cases, which embraced grandparents, uncles, and aunts, 59 per cent. Later

reports from the same source materially reduce these percentages in the case of direct hereditary predisposition. Thus, of one thousand cases accurately studied in this regard by C. Theodore Williams¹⁰⁰⁷ but one hundred and ten (*i.e.*, 12 per cent.) had parents affected with the disease, while brothers and sisters were affected in the case of two hundred and twenty-four, a disproportion which at once subordinates the *rôle* of heredity to that of association with affected cases.

After Koch's discovery of the tubercle bacillus⁹⁰ the possibility of hereditary transmission of tubercular diseases was denied by the adherents of the theory of parasitic origin. But recently there has been a growing belief with some workers on the subject that the old view founded on clinical evidence was right, and various hypotheses have been started to explain this on the bacillary theory. The most startling of these views is that propounded by Baumgarten,¹⁰⁰⁸ who is of the opinion that a child may be born with the bacillus tuberculosis in some of its tissues, and that it may remain inactive for years or throughout life. Firket,⁹² criticises very ably the evidence in favor of the hereditary transmission of tubercular disease. Some observers (Baumgarten, Landouzy and Martin)⁹² admit the possibility of a congenital tuberculosis, the actual occurrence of which has been rigorously proved by Johne in the fetus of a tubercular cow. Landouzy and Queyrat⁹² have also established the relative frequency of tuberculosis in infants. Such a transmission may be explained in one of two ways: (*a*) through the semen or ovum, or (*b*) through the placental circulation. The first view is, as yet, purely hypothetical, for one is not allowed to generalize from Johne's observation, who found in a small number of consumptives that the tubercle bacillus was present in the spermatie tubules and beneath the epithelium of the prostate without any appreciable disease of the organs. Further, Rohlf's has inoculated rabbits with semen from consumptives with uniformly negative results. However, admitting this possibility of inoculation of the ovum from the semen or maternal secretion, proof would be required that the development of the embryo would proceed regularly. Until such proof is forthcoming, *a priori* considerations are against it, not only from the behavior of other diseases, but, also, since Johne has pointed out that though uterine tuberculosis in the cow did not prevent conception, yet

cases of tuberculosis in the foetus or newborn were exceptional. An explanation offered by him is that in such cases abortion occurs, an accident observed very frequently in tuberculous cows. [In the human female, however, there seems no such tendency.]

The supposition that the bacillus may be transmitted from the mother of the foetus by means of the placenta seems more probable. This has been shown to occur for other bacteria. Thus, Spitz has demonstrated the spirillum of relapsing fever in the blood of a five months' foetus whose mother died of that disease. Arloing, Cornevin, Thomas, Strauss, Chamberland, Koulassoff, and von Fodor have met with like experiences with other micro-organisms. Neuhaus found the bacillus typhosus in the blood of a foetus whose mother aborted during an attack of typhoid fever. From these experiments one is forced to admit that the bacillus tuberculosis may also traverse the placenta, but this presupposes the existence of bacilli in the blood of the mother. This brings us to the difficult question in all parasitic diseases: How and when does infection occur? In anthrax, general infection after a short time is the rule, and in syphilis (probably due to a bacillus) it occurs in the majority of cases at the end of six weeks; but in ordinary phthisis the anatomical signs of an infection of the blood by the parasite are wanting in more than half the cases. When this infection is observed, it proceeds with slight and discontinuous steps, altogether different from the infection with anthrax. In a great number of cases of phthisis, we are not permitted to accept, until there is a proof to the contrary, that the blood is infected, an absolute necessity for transmission of the bacillus to the foetus by the placenta. One way to find out whether the blood becomes infected or not is by looking for the signs of secondary tuberculosis in organs which can only have been infected by the blood. The thyroid gland is such an organ, but it does not appear specially prone to tubercle, though Chiari found it affected in seven cases out of one hundred. In the kidneys it is easy to diagnose between primary tuberculosis and that of embolic origin. Of one hundred and forty-one autopsies of phthisis pulmonalis, Chiari found only thirty cases with tubercular lesions in the kidneys visible to the naked eye. There are, therefore, a sufficient number of cases where the bacillus is present in the blood of the greater circulation; and if

it infests the kidneys, why not pass out of the vessels of the maternal placenta? Yet Johnne in a case of acute general tuberculosis was unable to find the bacillus in the placenta. Landouzy and Martin^{Aug. 1}³ have obtained positive results after the inoculation of animals with the placenta of phthisical patients, but in default of the recognition of the typical bacilli these experiments lose their value, because it is possible to produce a pseudo-tuberculosis caused by some other microbe. Have we any evidence that newborn infants are already infected with tubercle? Numerous observers, by inoculating with tubercles animals in young, have produced abortion or premature death of the foetus, but never tuberculosis in the latter. Landouzy and Martin have produced tubercles by inoculating animals with pieces of organs from apparently healthy foetuses derived from tubercular mothers. These experiments are not free from the objection urged against the previous ones, *i.e.*, no attempt was made to demonstrate the bacilli in the "tubercles" produced. Leyden¹¹⁴^{Ed. 4, p. 388} has repeated them with negative results.

Since the greater portion of the blood of the umbilical vein passes through the liver, this organ should be the seat of preference for congenital tuberculosis of placental origin. In Johnne's case, referred to above, the liver presented the most considerable tubercular lesions. Charrin relates a case where a tubercular mother was prematurely confined at seven and a half months, and the child died three days after with tubercular lesions of the abdominal organs, especially the liver, spleen, and mesenteric glands. Merkel's case is that of a woman tubercular on conception, who was delivered at term of a child with a swelling on the hard palate, followed by an abscess on the left trochanter and speedy death. At the autopsy caseous nodules were found in the palatine arch, in the lymphatic glands, and behind the hip-joint, but the lungs were healthy. In neither case was the presence of the bacillus looked for. Is it possible for microbes introduced into the blood of a foetus *in utero* to circulate after a long time and fix themselves in some organ after birth, and preferably in the lungs? Wyssokowitsch and von Fodor have shown, however, with what rapidity the blood frees itself from microbes injected into it. They did not use tubercle bacillus, whilst Klencke and Koch have always produced tuberculosis when they injected tubercular prod-

ucts or the isolated bacillus into the blood. But cannot the tissues of the young possess a particularly strong resistance to the growth of the bacillus tuberculosis, so that its growth is slow and languishing, and can remain in the latent state for a variable period? Verneuil even goes so far as to admit that tuberculosis can exist throughout life in a parasitic form, to explain cases where tubercle skips a generation! Baumgarten, admitting that congenital infection is the rule, considers that embryonal tissues resist the invasion of the parasite more than the adult, and that, taken up from the blood, it passes a so-to-speak larval existence in the lymphatic glands, marrow of bones, etc. Later, during the extra-uterine life and owing to some external cause, as traumatism or inflammation, the vitality of the tissues diminish and the bacillus begins to develop.

Pasteur's researches on attenuated virus do not lend any countenance to the view that foetal and infantile tissues are more resistant to microbes. However, the spores of the bacillus tuberculosis might play some rôle in this "larval state," so that researches with regard to their physiological properties ought to be made. Should Baumgarten's hypothesis be ultimately proved correct, it would not explain cases of primary pulmonary tubercle, but such cases as tubercle in the cervical glands, the supra-renal capsules, and especially the bones and joints, so frequent in children.

Malvoz, of Liège, ²²⁴_{Nov. 24} proves, by a series of experiments, that the micro-organisms may only pass the placenta when this structure is diseased, a condition which may account for the few cases in which tubercle bacilli have been actually discovered in the foetus.

To conclude this part of the subject without further multiplication of citations, it may be said that, while direct hereditary transmission is possible, it must be very exceptional, and must be confined to cases of affection of the testicle, ovaries, placenta, or at least to affection of the blood. Weichselbaum ⁵⁰_{v. 2, p. 17} has, it is true, succeeded in demonstrating tubercle bacilli in the blood, but such success is very exceptional and fortuitous, and could occur only in cases in which bacilli were on their way to colonization in some organ of the body.

If tuberculosis be transmitted by heredity, it ought to show itself, as syphilis does, in internal organs, liver, spleen, kidneys, etc., first. But this is not the case. In the vast majority of cases the

disease shows itself first in the lungs, where, after the lapse of time, it may be transmitted to distant organs, and in these cases it is nearly always possible to find previous deposits in the lungs or bronchial glands, as primary deposits, or localizations. To hold fast to this view as first advanced by Koch, and most in accord with the ubiquitous distribution of the parasite, and not to clutch at possibilities, is to secure the final extinction of the disease.

Invasion by the Lungs.—The observations of Cornet, which extended over a period of two years, and were first published in abstract,⁸⁴ constitute the most noteworthy contribution to the etiology of tuberculosis since the disclosure of the tubercle bacillus by Koch in 1882. The fact that all experiments had failed to discover tubercle bacilli in the air or on the walls of houses led the author to adopt the inoculation test with sponge scrapings from walls and beds of rooms occupied by phthisical patients. The sponges were, of course, previously disinfected, and the animals inoculated were freshly bought and free from infection, and, if not dead from other diseases, killed after the lapse of forty days—a period in which the disease remains confined to the peritoneum into which the injections were made. The walls and headboards of beds, posterior surface uncontaminated by sputum or hands, of twenty-one rooms in seven hospitals of Berlin, occupied by phthisical patients, were scraped in this way, and ninety-four animals were inoculated with the scrapings. Fifteen, i.e., two-thirds, of the rooms furnished tuberculous matter. Of the ninety-four animals fifty-three died of other diseases; of the remaining forty-two, killed after forty days, twenty were tuberculous, twenty-two sound. The frequency of tuberculosis among the insane led the author to examine the walls of three asylums, all of which furnished a virulent tuberculous virus. Dust removed in eleven cases from different places in the near vicinity of tuberculous patients was introduced into thirty-three animals, of which sixteen died of intercurrent disease, three were found to be tuberculous, the remaining fourteen healthy. Sixty-one dust-tests from the walls of houses of fifty-three private patients affected with tuberculosis were introduced into one hundred and sixty-eight animals, of which ninety died soon after the injection, thirty-four were found tuberculous, the rest sound. Control experiments from houses not inhabited by tuberculous patients, from surgical

wards, operating-rooms, crowded streets in Berlin, and various public buildings, gave negative results. Of three hundred and eleven animals in all inoculated with dust from rooms occupied by phthisical patients, one hundred and sixty-seven died soon after infection, fifty-nine, *i.e.*, one-fifth of the whole number, were found tuberculous, and eighty-five were healthy. A room in a hotel occupied for six weeks by a phthisical actress, and a workshop occupied by a tailor who had directly communicated the disease to a fellow-worker, were found infectious. *But in no case was the dust of the walls infectious where sputum-cups were used exclusively to receive the expectorated matter*, notwithstanding the fact that such sputum abounded in bacilli. These observations, which singularly confirm the first statements of Koch, that the disease is chiefly spread by dried sputum, furnish convincing proof of the possibility of preventing tuberculosis pulmonum altogether, a possibility which should be seized upon with all the more avidity in that the same author (Cornet) shows the futility of all specific treatment with the most varied agents.

Liebermeister, ⁶⁹_{June 20} supports the view of dissemination of dried sputum, with the observation that the disease is most frequent in the most crowded quarters. One member of a family returning from abroad brings it at times to a whole family previously free, especially in the country, where people live close together, so that in coming years one member after another succumbs to the disease. So, also, married couples infect each other, the wife suffering most from her closer ministration. He can cite many cases where previously healthy families become infected one after another after removal to a house formerly occupied by a tuberculous patient. Yet phthisis is by no means so contagious as small-pox, else the human race would have become extinct. Certain conditions are requisite to infection. The disease is usually contracted through the organs of respiration. Dried sputa containing bacilli or spores disseminate particles in the air which, inhaled into the lungs by susceptible individuals, produce the disease. Most cases of phthisis are contracted in this way. Yet it is not impossible that the bacilli may be directly transmitted by heredity to develop early as a basilar meningitis, or to remain latent for a long time till quickened to activity by measles, whooping-cough, and other acute diseases, or later in life by bronchitis, pneumonia, diabetes, etc.

Ziemssen,⁴⁹¹ maintains that there is nothing but hypothesis to support the theory of direct transmission by infected spermatozoa or ovaries, except in the comparatively few cases of disease of these organs. Much more is to be hoped for from the extermination of the disease by the extra-uterine infection. Infants may be infected by contact with diseased parents, nurses, wet-nurses, by the infection of the milk of cows affected with disease, which may, according to the studies of Bollinger, transmit the disease to guinea-pigs even though the udder seems perfectly healthy. Five minutes' boiling of milk destroys this danger, but this precaution is universally neglected.

Tuberculosis often exists in a child when it seems perfectly healthy. Individual swollen glands, extirpated with every precaution, sometimes show bacilli in their interior. How long they have been there, or how many other glands may be infected, who can tell? Bollinger's autopsies on measles in Munich disclosed bacilli in lymphatic glands, in the apices of the lungs, and the mediastinum in children before in apparent perfect health and without a taint of scrofula. Thus, in these cases the measles only made manifest a latent tuberculosis which may have entered before birth, in the first year of life, through wounds or in milk. Some cases of so-called inherited predisposition are explained in this way. As to the acquired disposition, it is largely a matter of confinement in a close and infected atmosphere.

Baer's statistics of prisons show a mortality four times as great as outside. While the mortality of phthisis amounts to 15 per cent. of the whole mortality in the world at large, in prisons it constitutes 40 or 50 per cent.; that is, one-half of the whole mortality. Different prisons show different results—thus, Austria, in four years, 61 per cent., Bavaria, eight years, 38.2 per cent. The vast majority of cases occur in the last years of imprisonment, a fact which speaks for itself. The mortality of manufacturers is twice as great as that of outside occupations. Thus the mortality of agricultural occupations is 1.1 per cent., that of mixed population, 1.7 per cent., that of factories, 2.55 per cent. to the thousand. The young postulantes for the cloisters in Munich come to the institutions from various sections in perfect health to suffer in the course of a few years a mortality from tuberculosis of 50 per cent. With these facts in view, the statement of Williams regarding the

exemption from attack of nurses and attendants in the Brompton Hospital loses value. The attendants of all hospitals undergo frequent change, the same individual remaining rarely for years, and when their stay is prolonged the result is entirely different.

Rühle¹⁰⁰⁸ believes that the whole subject of heredity is better explained by family contact. Infection occurs chiefly by mouth to mouth contact, as from pocket-handkerchiefs and drinking vessels. Nurses are seldom attacked, because with them this mouth to mouth contact does not occur. Fraentzel¹⁰⁰⁸ maintains that nurses do become infected if they remain in contact with phthisical patients a long time, and Hueffe claims that they contract the disease by inhalation. Sée coincides with this view. *Per contra*, Landouzy and Martin¹⁰⁰⁹ claim to have secured positive results from the introduction of testicle substance and spermatozooids of tuberculous animals, a conclusion unjustified in their cases, Baumgarten¹⁰⁰⁸ thinks, because of failure to make control observations, to exclude the possibility of spontaneous infection.

Invasion by the Alimentary Canal ; Meat and Milk.—The most satisfactory contribution of the year upon the subject was made by Simms Woodhead⁶,_{July 14} in a lecture on "Tuberculosis and Tabes Mesenterica," delivered in the University of London. The author says: "Although tubercle in the human subject is so frequently met with in young married women, tubercular mammitis is extremely rare; eight cases have, however, been collected and recorded by Dr. O. Hubermaas."

In cattle, on the other hand, where the mammary gland carries on its functions under conditions which are far from healthy, or, at any rate, far from normal, tuberculosis is not by any means of rare occurrence. The first experiments from which actual proof of the infective nature of tubercular material was obtained were performed by Gerlach, who used milk of tuberculous cows with which to feed young animals. His results were not all positive, but he was successful in a sufficient number to justify his conclusion that there was some specific virus in the milk of tuberculous cows which would, when ingested, produce tuberculosis of the alimentary tract or mesenteric glands. Albert then recorded the case of a litter of young pigs which were fed on the rejected milk from a tuberculous cow, the whole of the animals succumbing to tuberculosis. Numerous other observers—

Klebs, Bollinger, Stein, Johne, Bang, Toussaint, Chauveau,³ and many others, besides Koch—concur in stating that if milk from cattle with tubercular udders be given for any lengthened period tuberculosis will be developed.

At the International Medical Congress, in Copenhagen, Bang³ gave the results of an examination of no fewer than twenty-seven cases of tubercular mammitis. He was able to demonstrate the presence of tubercle bacilli in the milk or in the sediment, and with this milk or sediment he was able to produce tuberculosis both by inoculation and ingestion. Nocard was able to demonstrate the presence of specific bacillus in milk in eleven cases.

The lecturer then gave an account of a most careful and systematic examination of over six hundred cows in the Edinburgh dairies, which he, with Professor McFadyean, had carried out. Of the whole he found thirty-seven beasts in which there was mammitis, but only six, or sixteen per cent., in the milk of which they could demonstrate the presence of tubercle bacilli, and then only in small numbers. In one of the six cases, and subsequently in five other cases, they made sure of the existence of bacilli in enormous numbers in the udder by microscopic examination.

This subject met with full discussion¹⁰⁰ in the Congress for the Study of Tuberculosis, held in Paris, July, 1888.

Cornil communicated some interesting experiments on contagion of tuberculosis through the mucous membranes. The cultures of the tubercle bacillus introduced into the intestine penetrate very quickly into the mucous parietes. In introducing into the œsophagus of guinea-pigs a few drops of tuberculous cultures, he observed that at the end of four days submucous tuberculous lesions, with rapid generalization without lesion of the epithelium, and bacilli are found in mesenteric glands. Nocard read a paper on the dangers to which one is exposed by the use of the flesh and milk of tuberculous animals. It would appear, from his very ingenious experiments, that the muscles destroy or digest the bacilli in such a way that the meat of animals affected with generalized tuberculosis presents but very little danger. Thus, four cats ate with impunity the flesh of a tuberculous cow, whilst a fifth cat that had eaten a lymphatic gland of the same cow succumbed in a very short time to experimental tuberculosis. Nocard, therefore, thinks that it is not necessary to exaggerate the precau-

tions or to hold Koch's bacillus in great dread, adding that one can eat without fear the flesh of tuberculous animals, the tubercles of which are limited to the viscera and to the different lymphatics: even that of animals the tuberculosis of which is generalized would be but exceptionally to be dreaded. As regards the milk, this should always be looked upon with some suspicion, and it should never be given to children without having been previously boiled. Goats' milk may, perhaps, form an exception to this rule, as a tuberculous goat is looked upon as a pathological curiosity. The question as to the danger to which one is exposed by the use of the flesh and milk of tuberculous animals and the means to prevent it was discussed. A large number of the members took part in the debate. All acknowledged that the use of the meat, and particularly the milk, of tuberculous animals should be regarded as dangerous. Arloing, Galtier, Butel, Rossignol, and Aureggio would vote for the complete seizure of the meat of all tuberculous animals instead of the partial seizure which M. Nocard judges sufficient. The foreign veterinarians present were all in favor of entire seizure. Jorissenne claimed for the Belgian veterinarians the honor of having raised the question of the danger of the use of milk. He stated that of every hundred cows four are tuberculous. In one shed of twenty cows the milk was found to present a prodigious number of bacilli furnished by tuberculous teats; he, therefore, insists upon the most radical measures.

Robinson, of Greenock, did not believe in the distinction that is sought to be established between localized and generalized tuberculosis. Considering the danger shown by statistics and the frightful proportion of tuberculous subjects among the human species, he proposes that the most energetic means should be employed. He said that he came from Scotland purposely to support these radical measures. All suspected meat should be seized. Dionis des Carrières stated that to the present day we have not had the demonstration of a single case of tuberculosis determined by the use of meat taken from a tuberculous animal. He asked why a substance only suspected should be rejected from the list of aliments, and suggested that before adopting such radical measures a series of experiments should be duly performed. With this view he proposed that the next criminal that may be condemned to death should be subjected for fifty days to a diet of

tuberculous meat, whereby the relation of cause and effect could be traced. Peuch, of Toulouse, showed the noxious action of the milk and the meat of tuberculous cows. The Congress voted, in principle, that the flesh of a tuberculous animal should be seized in totality.

Chamberland made a communication on tuberculous meningitis during pregnancy, and proposed, in certain cases, to induce premature labor.

Degive, of Brussels, proposed a very simple means employed in Belgium to avoid all transmission of tuberculosis from a vaccine animal. The heifers which furnish the vaccine lymph are opened before the lymph is utilized, and this is used only when the animal is recognized as being healthy. Chauveau observed that the same procedure is in use in Lyons and in a great many vaccination establishments in France. He considers this the most radical procedure. But tuberculosis is so rarely transmissible by superficial inoculation of the skin, and the vaccine pustules in tuberculous animals are so seldom charged with tuberculous matter, that it would be wrong to fear inoculation of tuberculosis by vaccination, even when the precaution proposed by M. Degive is used.

Mosler, of Greifswald, reports¹⁰⁷_{Sept. 11} on the infection of the intestinal mucous membrane from the swallowing of tuberculous sputa. In one case which he treated in hospital the patient, who was rather stupid, could not be persuaded into ejecting the sputum, but invariably swallowed it in quantities which other symptoms showed to be very great. Ten days after his first attack of cough with expectoration, diarrhœa with severe colic came on, which was relieved by opiates and other appropriate remedies, but which, nevertheless, went on until death occurred in ten days. Distinct signs of tuberculosis were found in the lungs, but nowhere else in their immediate neighborhood, and in no other part of the body except in the intestines and jejunum. Mosler attributes the presence of tubercle in the intestines more to swallowing the sputa than to general infection. He has not as yet succeeded in producing tuberculosis in the intestines of animals by feeding them on tuberculous sputa and pieces of solid tubercle, but in one case it caused considerable inflammation of the stomach and small intestine. A tonic prophylactic treatment in the direction of the bowels is indicated, as tubercle chooses the weakest organ for its

development. The case cited had gone through an attack of typhoid fever some little time before, which might have predisposed to the infection.

Cagny,³ at the Congress for the Study of Tuberculosis, related a case of tuberculosis transmitted from man to poultry. The chickens belonging to a certain family, one member of which was suffering from pulmonary phthisis, were found to be almost all diseased. The author learned that the sick man was in the habit of walking in the garden, and it had been noticed that the chickens had eagerly seized upon the matter expectorated by him. The chickens had tuberculosis of the liver, and it was found necessary to sacrifice the whole flock.

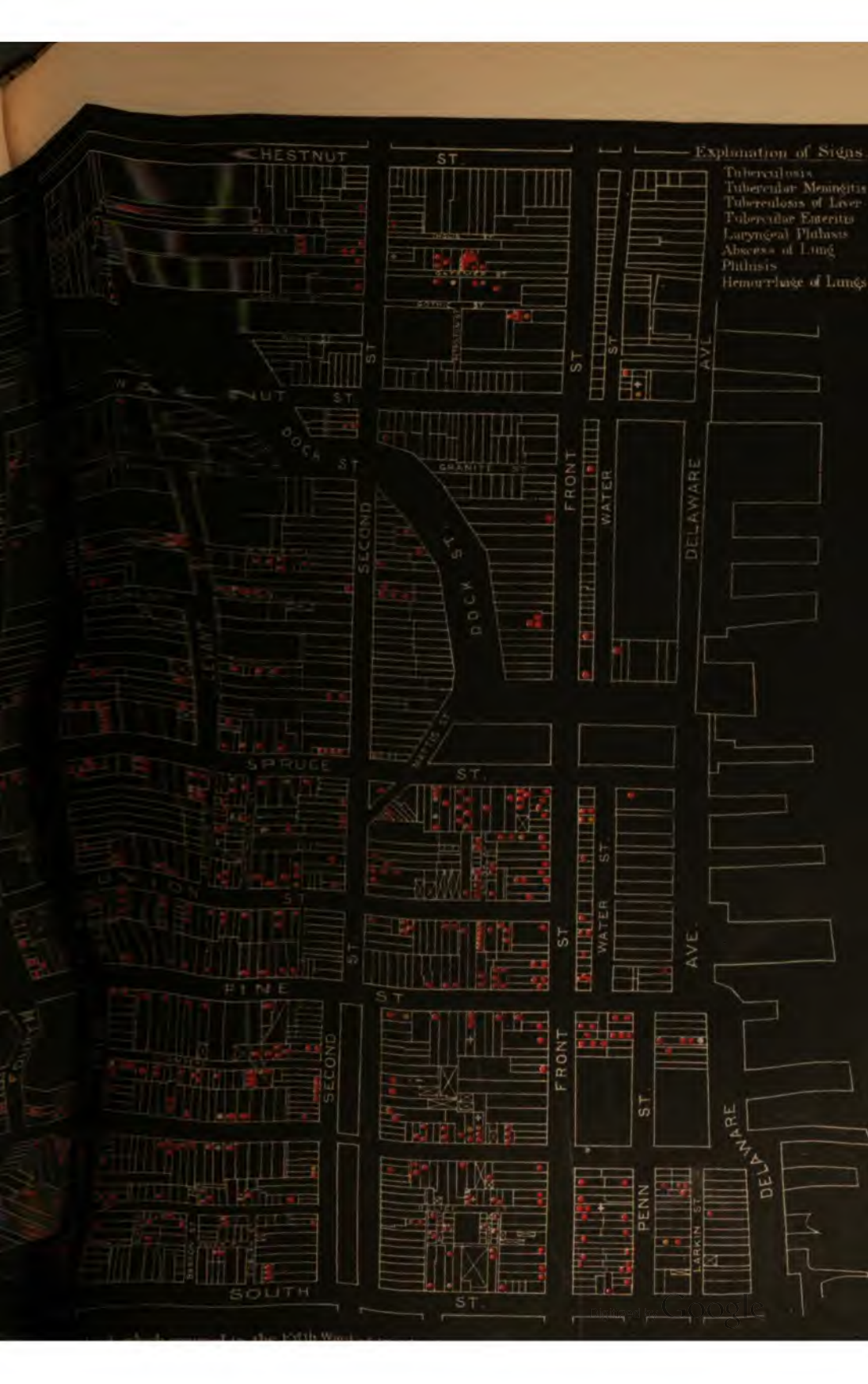
Contagion.—By far the most instructive contribution of the year upon this subject is the paper by Lawrence L. Flick, of Philadelphia,¹⁰¹⁰ which is illustrated by a series of maps prepared with great care, one of which, here reproduced in color, locates every death from tuberculosis in a single ward of Philadelphia for twenty-five years. Though the author is led to the conclusion, erroneously, as we believe, and totally unjustified by either his facts or maps, that the disease is mainly introduced into the alimentary canal because most cases are preceded by disturbances of digestion, this statement does not detract from the very great value of the maps as evidence of the contagiousness of tuberculosis, *q. e. d.* It is seen, the author comments, that of the infected houses scarcely 10 per cent. are isolated—that is, standing by themselves—or, rather, not having an infected house next to them. About 33 per cent. of the infected houses, moreover, have had more than one case. These two facts alone seem to warrant the conclusion that consumption is never contracted except either by contact, by association, or by living in close proximity.

How closely consumption follows this first law of contagious diseases is demonstrated by diagrams of small-pox, typhoid fever, diphtheria and scarlet fever, with those of phthisis. The grouping is identically the same, while it can be seen the localization is also influenced by the age of those predisposed to the disease. Another distinguishing mark of contagious diseases and one well demonstrated in the diagrams is the fact that, after it has used up all the available material in a district it dies out, to reappear when new matter fit for its operation presents itself. It is this law of self-

limitation which produces what are called cycles of disease, which in days of bad hygiene constituted scourges. The duration of a disease regulates the time required for its self-extinction. Most of the contagions run a rapid course, and, therefore, produce short epidemics. Phthisis being of long duration, each individual case can infect all the susceptible persons who come in contact with it for a number of years, and in this way the epidemic becomes prolonged. The duration of epidemics, as they are properly called, appears to be about three years, some being longer and some shorter. A series of epidemics dovetailing into each other give a city and the country at large the appearance of a perpetual epidemic which yearly claims the same number of victims. An analysis, however, of these facts shows that the large epidemic consists of a very small number of small epidemics. Another landmark of contagious diseases, and one already touched upon, is that they develop pre-eminently in filthy neighborhoods in which the outside and inside hygienic conditions of dwellings are bad. The compliance of consumption with this law is well demonstrated by the diagrams. It will be seen that it occupies the very same locality as typhoid fever and small-pox, and the notes show that it often occurs in identically the same houses. Map No. 3, reproduced here, which is a careful drawing of all the building lots in the ward, taken from actual surveys, and, therefore, absolutely correct, and which has located on each lot the number of cases of consumption which occurred upon it during the twenty-five years, as correctly placed as care could place them, will show that a house which has had a case of consumption will probably have another within a few years, and may have a large number of cases in quick succession; that when a case of consumption occurs in a house, approximate houses are considerably exposed to the contagion; that houses in localities where endemic after endemic has existed have, nevertheless, escaped the disease; that tuberculosis of various kinds occur in the same localities and often on the same lots as consumption; that, whilst density of population and filth attract the disease, thinness of population and cleanliness afford no protection when the disease-germ is introduced into a locality; that the disease has a decided predilection for the colored race; and that during the twenty-five years scarcely twenty per cent. of the houses of the ward were infected.



Map giving exact location of all deaths from phthisis, laryngitis, and related diseases.



Explanation of Signs

- Tuberculosis
- Tubercular Meningitis
- Tuberculosis of Liver
- Tubercular Enteritis
- Laryngeal Phthisis
- Abscess of Lung
- Phthisis
- Hemorrhage of Lungs

It may be well, in conclusion, to answer some of the objections which are raised against the theory of the contagiousness of phthisis. The oldest, and possibly the one that has done more than any other to obscure the vision of thinkers on the subject, is the fact that nurses in hospitals for consumptives and physicians treating cases of consumption do not, as a rule, contract the disease. It was this argument, advanced by the professors of one of the great medical schools of Great Britain (Edinburgh, 1793-94), which gave the death-blow to the theory in its infancy in England. It has been the standing argument ever since; and whilst it may have been a strong and proper one at one time, at the present stage of medical science it is so frivolous that, were it not so consonant with general belief and public prejudice, no scientific man would dare advance it. Nurses in typhoid fever and cholera hospitals and physicians attending upon typhoid fever and cholera patients do not usually contract those diseases; and yet who would use that fact as an argument against the contagious nature of those diseases? It must, moreover, be borne in mind that a deranged stomach and some form of malnutrition are essential precursors of phthisis, and that nurses and physicians are usually well nourished and healthy people.

Another and a very odd objection to the theory is, that consumption does not carry off enough victims for a contagious disease. The persons who raise this objection admit that a great many die of consumption, but they claim that inasmuch as the disease is so wide-spread, if it were really contagious it ought to exterminate the human family. Such persons lose sight of the two great laws which keep in check all contagious diseases, and but for which the human family probably would become extinct, namely, acclimatization and exhaustion of proper materials. In some parts of Asia cholera is always epidemic, and yet the country remains densely populated. Finally, many are willing to admit that consumption is contagious, but they do not think that it is sufficiently so to be taken much notice of or to warrant governmental interference. They, themselves, have been exposed frequently and have not contracted the disease, and they, therefore, cannot see how it can be very contagious. It is true that the rich and those in comfortable circumstances have it in their power to escape the disease if they have the wit to do so. But how about the

poor—they who, like dumb cattle, are driven by their necessities into the very face of death? Consumption claims most of its victims from that class, and they have neither the power nor the knowledge to escape its clutches. Does not the government owe them a duty? If consumption is contagious, it must be exterminated, or, at least, its ravages much curtailed; it consequently behooves every government to take up some other position in the matter than one of passive neutrality.

Invasion by the Skin.—The study of tuberculosis,⁸⁰ in the light of Koch's great discovery of tubercle bacillus has explained some of the heretofore incomprehensible manifestations of exceptional cases. We now know with a fair degree of certainty that the dissection—anatomical or post-mortem—tubercle is the result of inoculation, and may be defined as a local tuberculosis. Steinthal reports the case of a woman who contracted tubercle of the skin, of the hand from washing the clothes of her phthisical husband. Several cases of inoculated tubercle have been reported as caused by an infected operating-knife, and Meyer relates a case of tuberculosis of the genital organs resulting from a circumcision after which the wound made in the site was sucked by a tuberculous operator. According to Finger, a tuberculous patient of his had a number of dissection warts which, under the microscope, showed the tubercle bacillus long before general tuberculosis had set in. So far as the rite of circumcision is concerned, it has repeatedly, we understand from various authorities, led to the inoculation of both syphilis and tubercle. Demands have, therefore, been made for the hygienic regulation of the rite.

Communication by Flies.—A communication was made last year to the Academy of Medicine, of Paris, by Spillman and Haushalter,¹⁹ in which they showed it possible for flies to carry with them the contagion of tuberculosis. A new and highly interesting contribution on this subject has been recently furnished by E. H. Hoffmann,⁴¹ of Dresden. It seems that Dr. Hoffman found some flies in a house where a patient had died with advanced tuberculosis, and whose sputum had contained great quantities of tubercle bacilli. These he took home and subjected to examination. Tubercle bacilli were found in their intestines, at first in larger and subsequently in smaller quantities. Their excretions, which covered the walls of the house in the form of numerous

specks, also contained tubercle bacilli. Dr. Hoffman prepared the specimens by carefully taking a speck of fly excrement from the wall with a platinum needle and rubbing it with water on a cover-glass. In no preparation did he find the bacilli. As often as he had examined flies in his house he never had been able to find bacilli in their intestines or their excrement. On the other hand, he fed some flies which were apparently healthy upon tuberculosis sputum, and found that in a few days a large number died, so that the chandeliers were covered with dead flies.

To determine the vitality of the bacilli transmitted by flies he inoculated them into the anterior chamber of the eyes of guinea-pigs. Of five experiments four were without result. In the one, however, the success was complete; at the autopsy a large number of fresh, small tuberculous nodules were found in the lungs, " " , and spleen, while the bronchial tubes were swollen. The question of the vitality of the bacilli transmitted by flies must, therefore, be answered in the affirmative.

Tenacity of Life of the Bacillus Tuberculosis.—The germ of tuberculosis realizes a collection of conditions eminently favorable for remote infection,⁶ for it survives the majority of microbes usually associated with it. Neither drying nor putrefying appears to destroy it, whilst both processes allow its being distributed through air or water. Cadéac and Malet²¹¹ have sought to discover the time necessary to destroy the germs of tuberculosis in desiccated, putrefied, or frozen matter. The experiment proved that tubercular matter, dried and pulverized, may preserve its virulence, since one hundred and two days after its preparation it was capable of transmitting tuberculosis. Schill and Fischer maintained that tuberculous matter only loses its virulence after six months. Pietro asserts that well-dried sputa may retain infection for nine or ten months if maintained at a mean temperature of 25° C. (77° F.), but it appears probable to Cadéac and Malet that the virulence does not persist after thirty or seventy days unless special care is taken to preserve it. Galtier has found tubercular matter to be virulent after fifteen days, one month, and thirty-eight days of desiccation.

These somewhat conflicting results are sufficient, however, to show the desirability of completely destroying all the tubercular matter ejected by patients, and is also an argument in favor of

cremation (?). Cadéac and Malet find that the virulence is maintained one hundred and fifty days in pieces of dried lung exposed during winter and spring to the atmosphere. When dried pieces have a considerable volume, the virulence lasts longer than when the matter exists as fine dust. It is probable that the rapid disappearance of the virulence in the fine dust is due to the action of oxygen in the atmosphere, which is enabled to come in contact with all the tubercular molecules. As to the influence of putrefaction, one hundred and sixty-seven days appears to be the limit of tubercular virulence in tubercle allowed to putrefy by itself. About one hundred and twenty days was the duration of virulence when the tubercle was allowed to decompose in water. Tubercular liquids exposed to the air and to various external conditions more rapidly lose their virulence than do tubercular solids. In other words, putrefaction exercises much more rapidly its destroying effects when the putrescible mass is of but little volume. The duration of the preservation of virulence in hard and compact tissues, like the tubercular lungs of ruminants, is also proportional to the size of the organ submitted to putrefaction. It is the same to a certain degree for tubercular matter submitted to the process of desiccation. In the numerous experiments from which the above conclusions were arrived at the pieces of tubercular lung were kept at a temperature from one degree to eight below zero in such a fashion that the matter remained frozen sometimes more than a week, yet virulence was maintained for seventy-six and one hundred and twenty days.

Max Voelsch³¹⁹_{June 30} found that twice boiling attenuated, but did not destroy, virulence, while boiling once did not even reduce virulence. Decomposition always reduces it sensibly. Matter containing spores is not more resistant than sporeless matter. Bacilli, with or without spores, show about the same tenacity of life.

Staining of Bacilli.—Tubercle bacilli are readiest and best stained by Gabbet's method, as described by Günther.⁸_{no. 13} The dry preparation is first placed for two minutes in a solution of fifteen grains of fuchsin in three and a quarter ounces of a 5 per cent. solution of carbolic acid and two and a half drachms of absolute alcohol. It is then placed for one minute in a solution of thirty grains of methyl-blue and three and a quarter ounces of sulphuric acid, then rinsed in water and examined in this medium, or, better,

is treated with absolute alcohol and examined in Canada balsam. The bacilli are red, the field blue.

Culture and Ptomaines.—Hammerschlag, of Berne,²¹⁴ calls attention to the great value of the bacteriologico-chemical studies of Nencki and Brieger, and abstracts the results of the recent work of Nencki, of Berne, concerning tubercle bacilli. In this work various culture soils were used. A very good soil, given by Nocard and Noux, is the 5 per cent. glycerin-peptone—agar—and the 5 per cent. glycerin-peptone bouillon. Growth appears in the first soil from four to five and in the second in seven to eight days after inoculation. A quite rich culture ensues in seven to eight weeks. The glycerin may be substituted by mannite and grape-sugar, and the soda salts by potash, without influence on the culture, but peptone cannot be substituted by tyrosine.

A fresh decoction, with 5 per cent. of glycerin, forms a very good soil, upon which forms, in four or five weeks, a rich culture consisting of large, tough, firm masses or balls, which float in the lower layers of the fluid. An analysis of the bacilli shows: Water, 88.82 per cent.; solids or dry matter, 11.18 per cent. The solid substances contained 22.7 per cent. matters soluble in alcohol and ether. The matter left after extraction with ether and alcohol contained: Ash, 8 per cent.; carbon, 51.02 per cent.; hydrogen, 8.07 per cent.; nitrogen, 9.09 per cent. The remarkably large amount of matter soluble in alcohol and ether distinguishes tubercle from any bacteria hitherto examined. Experiments on animals prove the existence in these soluble matters of a poisonous substance with tetanic action. As it has not yet been possible to perfectly isolate this matter, the conclusion is mentioned with some reserve.

Bonardi¹⁰¹¹_{March 2} succeeded, after repeated chemical analysis of tuberculous sputum, in demonstrating organic bases which show all the general reactions of alkaloids, and which, introduced into rabbits and guinea-pigs, caused in a short time somnolence, disturbances of co-ordination, increased frequency of pulse, weakening of the heart-strokes, arhythmia, superficial respiration, and mydriasis. Among these organic bases there is present, in all probability, neuridin, which, as is known, is produced in the development of the bacteria of decomposition. The author promises later a full report concerning the alkaloids found in the sputum, contenting himself

at present with the statement that these organic bases may explain the fever, sweating, disturbances of circulation, and other general symptoms of the disease.

Forms and Phagocytes.—Metschnikoff²⁰_{R. 113, p. 68} maintains that the tubercle bacillus is not a final, but only a definite, stage in the cycle of development of a certain rod or thread bacterium. Bacilli and threads may be exceptionally very thick, as the author observed in the anterior chamber of the eye of a rabbit killed six months after inoculation. Moreover, forms are various in culture soils. The common bacillus form prevails, it is true, but there exist also short rods, double rods joined together, and rounded, oval, and lancet-shaped varieties. High temperature remarkably increases these varieties, so that in the course of twenty days there are observed among the common forms several very much larger and thicker. These forms take color much more intensely. Their ends protrude to form buds, a regular stage of development of tubercle bacteria. The resistance of tubercle bacteria to coloring matter implies the existence of a very tough, resisting membrane, and the more intense coloration (with the basis color) of the budding stages shows that the envelope of the large forms is firmer than that of the bacilli. The name bacillus is unjustified. The author suggests for the family the term *sclerothrix*, and for the species *sclerothrix Kochii*.

The furred marmot (*Spermophilus guttatus*; Lemminck) is the best subject for studies of the struggle between giant cells and the tubercle bacillus. This species of animal may carry large quantities of tubercle bacilli for a long time. Section shows nodules in no organ, but abundant giant cells in every possible stage of development. Giant cells in this animal arise by outgrowth of the epithelial cells under a very peculiar process of budding of the nucleus. The giant cells, as well as the epithelial cells which produce them, are all true phagocytes. The combat begins with the ingestion of the bacilli by the epithelial cells, whereby the microbes are sometimes killed. The struggle with the mature giant cells is much more intense, as every grade of degeneration is encountered in ingested bacilli. Occasionally are seen in the interior of a giant cell a heap of bacilli which are distinguished by abnormal coloration or peculiar form. Many of these ingested bacilli show a clear space in their interior resembling capsule bacteria. The bacilli,

themselves, are, then, usually paler and thinner, and sometimes thickened at the ends. They may lose their color entirely to show very dark, sharp contours. Later they disappear entirely. According to Metschnikoff there is here an intercellular destruction of the tubercle bacilli, a process not observable in cultures nor extra-cellular in the tissues. Proof that the bacilli are destroyed in this way is found in the fact that the interior of the giant cells shows only yellow degraded bacilli which never contain spores. But very often the bacilli gain the victory. The author found abundant bacilli perfectly normal in every way in the giant cells of mesenteric glands after long infection; not infrequently dead bacilli in the centre and normal bacilli in the periphery of the cells. But it is rarely that giant cells are actually destroyed by bacilli. Cheesy detritus is never seen in this animal. The longer the time between infection and examination, the more marked are the appearances of degradation of the bacilli.

Bacterial Associations of Tubercle Bacillus.—Babès, of Bucharest (Congress Tuberculosis, Paris, July 25–31, 1888¹⁰⁰_{Aug.}), said that out of seventy-three post-mortems of children he found sixty-five cases of tuberculosis of the glands. Koch's bacillus was found forty-five times. Out of fifty-two post-mortems of extensive tuberculosis, Koch's bacillus was only found alone ten times. In forty-two out of the fifty-two tuberculosis was very apparent; but in all those cases Koch's bacillus was associated with other micro-organisms. The bacteria that complicate tuberculosis in children are the streptococcus, aureus and albus, and the pus streptococcus. In tuberculous pneumonia, pleurisy, peritonitis, or meningitis, Koch's bacillus is always found associated with other microbes; and these additional microbes are those that are found and produce the disease of the organs involved—Friedländer's microbe for pneumonia, etc. In local tuberculosis of bones and articulations we have a complication by the addition of pus streptococcus, which is found in all organisms. Tubercular lesions are the door-way by which these different microbes invade the organism and mix with the tubercle bacillus. In children, especially, tuberculosis rarely kills without additional complications; one must also admit that latent encapsulated tuberculosis, very common in children under the form of tuberculosis of the lymphatic glands, can become very active and severe under the influence of other microbes.

Symptomatology.—Liebermeister⁸⁰ speaks of the great variety of forms characterizing the onset of the disease as determined by different localization, acute and chronic cases, miliary tuberculosis, etc., but remarks upon the uniform appearance in the great majority of cases beginning in the lungs. The author recognizes three stages whose limits are not strictly defined—phthisis incipiens, confirmata, and consummata. Cure or arrest of the disease is possible only in the first stage.

Phthisis incipiens begins insidiously, most commonly as a catarrh of more or less intensity, range, or frequency of recurrence. There is cough with slight mucus, later muco-purulent expectoration. Suspicions become stronger with temporary evening fever, thirty-eight to thirty-nine degrees, emaciation, pallor, and dyspnoea on exercise. A family history or close contact with other cases constitute additional evidence, as do also the phthisical habitus, former frequent catarrhs, pleurisies, pneumonias (especially following pertussis and measles), scrofulous glands, bones, and joints.

Percussion shows sometimes slight dullness at one apex, whose limit should be marked with a pencil. Auscultation reveals catarrh, which is more suspicious when obstinate and when the rest of the lung is free.

A permanent apical catarrh, with evening fever and deterioration of the general system, almost surely indicates phthisis. A feeble or undefined vesicular râle is as characteristic as rude inspiration and prolonged expiration. Cog-wheel, interrupted (*saccadée*) respiration means atrophy of the muscles, which may exist in other affections, but most frequently in this disease. Sibilant or moist râles confined to the apex are sure signs.

Negative results in the examination for bacilli do not exclude the disease, as there may be no sputum for some time, or what there is may contain no bacilli; but negative results after repeated examinations are of more value. Emaciation, blood poverty, chlorosis, diminution of menses, are valuable signs. Anorexia and dyspepsia usually attend the onset of the disease. The heart becomes irritable, the pulse more easily influenced. There may be hypochondriasis, but there is more frequently a disposition to undervalue symptoms. Many patients feel no pains or only wandering pains in the different regions of the chest, which are considered rheumatic. Pityriasis on the chest or back is more frequent than in other diseases, possibly because of the more frequent sweating.

F. Bompard (Paris correspondence,²_{Jan. 22}) made an interesting communication to the Société de Médecine de Bordeaux on atrophy of the thorax in phthisis, of which the following is a summary: 1. Muscular atrophy is frequent in tuberculous subjects. 2. It is met with in the neighborhood of pulmonary lesions and especially at the apex of the thorax. 3. It presents the following characters: (*a*) diminution of volume; (*b*) subsidence of prominences; (*c*) exaggeration of hollows; (*d*) diminution of strength; (*e*) diminution of electrical contractility. 4. It may be an early symptom. 5. It is sometimes accompanied by sharp pains in the muscles which are undergoing atrophy. 6. It constitutes a complication of pulmonary phthisis, augmenting the difficulty of breathing, and in this manner contributes to hasten the progress of the disease. It is, therefore, most important to combat this form of muscular atrophy, which is common, particularly at the outset of the disease, when a cure may still be hoped for. For this purpose nothing can be better than chamber gymnastics, already so much recommended by M. Peter in 1879.

Senile Phthisis.—Dr. D. Colquhoun,²⁸⁵_{Jan. 15} of New Zealand, contributes a valuable paper on this subject, in which he expresses the opinion that this form of phthisis is common, and presents difficulties in diagnosis that cause it to be often overlooked. MacLachlan, in his most excellent work,¹⁰¹² says that the phthisis is “far from infrequent beyond fifty and is occasionally observed in persons who have passed their ninetieth year. It may be safely affirmed that many die from consumption beyond seventy who, from the erroneous supposition of extreme rarity of phthisis in old age, or from equally erroneous views of the pathology of the disease and the not infrequent obscurity of its symptoms in advanced life, are presumed to die of some other affection.” Speaking of the symptoms of consumption, he says the latent form of senile consumption is as common as the acute is rare. A very great number of old people, invalids without defined disease, supposed to be wasting away from mere debility of advanced age, are the subjects of this form of phthisis; and we are often surprised, on post-mortem examination, at the extent to which the lungs have become solidified by chronic pneumonic induration or by the dissemination and clustering of crude tubercles, and even partially ulcerated and disorganized, without any material derangement of the general health,

cough, or dyspnoea sufficiently obvious to attract attention. With reference to diagnosis, he places emaciation in the first place among the signs of senile phthisis. Sometimes it is almost the only symptom observed. Its constancy is worthy of every attention, as, in the words of Louis, "supplying the observer with some useful hints in respect to diagnosis in cases of latent phthisis." In many cases the detection of consumption in the aged is exceedingly difficult and in others wholly impossible. The emaciation of the thoracic muscles, the rarefaction of the lungs, the ossification of the ribs, all increasing sonorousness of the chest, in old people add to the difficulty. "But I do not wish to imply that these difficulties are met with in all cases of senile phthisis. In some cases the diagnosis is as easy as in the young adult. I do not know that we can deal with these difficulties better than by stating and discussing them. Many of the cases of senile phthisis are simply revivals of disease of early life; other cases, no doubt, arise for the first time in old age." Acute cases are doubtless rare, but "chronic cases," as MacLachlan says, "are probably much more common than is generally suspected." In cases of suspected phthisis the use of the test for bacilli would be useful, but in many cases the disease pursues its march for a long time without giving rise to any suspicion as to its real nature, and is tardily recognized during life or, perhaps, only on the post-mortem table.

Diagnosis of Tuberculosis.—P. Kidd and Taylor² presented a communication to the Royal Medical and Chirurgical Society, the object of which was to emphasize and illustrate the value of the sputum test when systematically applied to all cases of disease of the respiratory organs of doubtful nature. The paper dealt only with cases in which other recognized methods of clinical investigation failed to indicate a definite diagnosis. In the great majority of the cases described, numbering over ninety, positive results were obtained, only a few negative cases having been included, where the value of the evidence was tested by post-mortem examination. The detection of tubercle bacilli in such cases was often extremely difficult, and repeated examination might be necessary where the number was very small. The time required for such investigation was, however, well repaid when, as often happened, a positive diagnosis could be arrived at without delay and without waiting for the progress of the case to decide the point. Success depended

largely on the following points: Judicious selection of the sample of sputum; method of preparation and staining; careful examination with suitable appliances. The cases described fell into five main groups: 1. No physical signs of disease of the respiratory organs. 2. Laryngeal disease of uncertain nature, without definite pulmonary signs. 3. Signs of bronchitis, with or without emphysema. 4. Signs of pleurisy. 5. Signs of doubtful import—(a) anomalous physical signs, (b) slight signs at the apex, (c) signs confined to or most marked at the base. The tubercle bacillus had been found to be of little use for purposes of prognosis. C. T. Williams² was ready to confirm every point; but he thought it would be a pity if attention to the bacteriological part of the subject interfered in the least with the careful examination of all previously available physical signs. In diagnosis of laryngeal diseases he thought examination of sputa for bacilli of great value, and perhaps of even greater value in cases of bronchitis and emphysema where the tubercle was masked by other diseases. In two small groups of cases beyond those the author had mentioned he thought the examination very useful, namely, in cases of pyrexia and wasting without any physical signs of disease of the lung. In some of these he had found the bacilli before the physical signs, and again in some senile cases where bronchial catarrh masked tubercular disease. In cases of physical signs at the bases only it often happened that the original attack had been at the apex, where it had become quiescent and recrudesced at the base. He did not agree with the conclusions of Drs. Kidd and Taylor that the bacillus was of little use in prognosis. That the results were disappointing he would allow; but the bacillus was sometimes important in cases of arrested phthisis, in which the process might come on again; it might be of special importance in giving or refusing medical consent to marriage. Dr. G. Heron² agreed to the importance of the presence of the bacillus in settling a tubercular diagnosis in some cases of laryngeal disease and some of bronchitis and emphysema. At the Victoria Park Hospital he had paid some attention for six years to the inferences in prognosis to be drawn from frequent examination, and he thought they were of great importance. If he found a case in which the number of bacilli remained small during several weeks of examination he thought the prognosis much better than one in which the number

remained steadily large, and this though he might never have seen the patient. Dr. Douglas Powell valued the paper very highly and agreed with them that the bacillus was valuable in diagnosis and not of much use in prognosis. For prognosis in a distant patient, such as Dr. Heron had suggested, he would as soon take a report of his weight or of his physical signs, or even a photograph. In laryngeal cases, he agreed, it was valuable for diagnosis, and might show phthisis when an aneurism masked the physical signs. In cases which had been continuously and carefully watched he had sometimes known physical signs come before bacilli. Dr. J. K. Fowler wished to bear testimony to the examination for bacilli in cases of spare men with some bronchitis and emphysema. They were not infrequently cases of arrested phthisis. Recently, in a life-insurance case of considerable importance of this class, he had been very much indebted to the examination of the sputa by Mr. Taylor, as showing a concomitant and probably antecedent tuberculosis.

Francis Troup³⁶_{July} generally examines the fresh sputum without any preparatory treatment, and finds what he looks for if it is there at all. The staining properties of bacilli remain unimpaired for very long; in spit four years old they stain as easily as they did when it was recent. "For merely diagnostic purposes the most trustworthy stains are two—the aniline fuchsine of the Koch-Ehrlich and the carbol fuchsine of the Nielsen solution. The latter is the preferable, for it does not soon decompose, can, therefore, be prepared in quantity, and stains as intensely after months as it did at first, whereas the aniline-water stains soon become turbid and useless. However, if one can be at the trouble to prepare the aniline water for each examination, or at most after the lapse of a week or two, it is quite as trustworthy as the other. As to the microscopical requisites, I have to say that if the bacilli are numerous and one possesses a certain amount of skill in recognizing them they may easily be found with a dry object-glass of two hundred and fifty diameters, or even less; but by far the most satisfactory mode is to use some form of condenser, as Abbé's, for illumination, and an immersion object-glass, water, or, still better, oil. The latter can now be obtained very cheaply, and Mr. Forgan manufactures a Leitz one-twelfth of an inch quite equal in its performance for diagnosis to the Zeiss one-twelfth, and at nearly one-fourth of the

price of the latter. If the bacilli are detected their diagnostic significance is the highest possible, and they are to be found in every case of tubercular phthisis, and in it alone of lung diseases—now numerous, now scarcer, but appearing with a persistence that will not escape the notice of perseverance and a modicum of practical knowledge in the search. Therefore, a negative result in the hands of one accustomed to the examination (and every one can easily acquire the necessary skill) is also of great value diagnostically. Naturally, it is only where the breaking up of the original reaction products has begun and opened a way outward for the bacillus that it will be found. In acute miliary tuberculosis it will not be seen at the beginning, and it is here and in all suspicious cases that a thorough test for elastic tissue should be instituted. The two methods should go hand in hand. As to prognosis it may be asked: Has the number or size, etc., of the bacilli in sputum any demonstrable connection with the probable course of the phthisis?" With the sole exception of the constant appearance of swarms of the beaded bacilli already alluded to he would say, most decidedly, No. Prognostically we are in no better position with the bacilli than without them. The one thing certain, however, is that the lung disease is tubercular where they are present. The prognosis even of a tubercular process depends on many other factors than the number of bacilli—the amount of fever, for instance, the sweats and diarrhœas and cachexia, and the intensity of the destructive process in the lung, as measured by the amount of elastic tissue shredded off.

Elastic Tissue in the Sputum.—The same author in the same essay remarks, "that prior to the discovery of tubercle bacillus great reliance was placed on the presence of elastic fibres in the sputum as evidence of phthisis." They were considered pathognomonic of the disease, and even now he does not consider this view to be a very highly exaggerated one. In no case of phthisis will they be missed if sought for with sufficient patience. They are to be found very early in the disease, and in the most innocent-looking sputum. They will be discovered before stethoscopic or percussion sounds, even when listened to by skilled ears and interpreted by skilled brains, give any other than uncertain information as to what is going on. That they precede the bacillus, mayhap for a considerable time, as daily examination of the expectoration

of more than one early case taught him, he can affirm with confidence. Therefore, their diagnostic value is of a very high order and should not be disparaged in favor of the tubercle bacillus, to which he does not think a first place should be conceded. The bacillus may be absent temporarily; not so the elastic tissue, which may be detected abundantly where bacilli are extremely few in number. For its discovery no elaborate microscopical appliances are necessary—a power of one hundred and fifty, or even eighty, diameters is amply sufficient, and when seen the evidence of lung disintegration is unassailable. It has been said that unless the tissue has an alveolar arrangement much stress need not be laid on its appearance in expectoration. This is a great mistake. He showed photographs, selected from many in his possession, from cases of undoubted pulmonary phthisis where this alveolar arrangement was very well seen, and others where the fibres were straight and in thick fasciculi, totally destitute of alveolation. No preparatory treatment of the sputum is needed for their demonstration. One, after a little experience, is able to select the dirty-white or reddish-yellow particles in which the fibres are likely to be found. A little morsel is pressed between the slide and cover-glass and the examination proceeded with; or a drop of a 30 per cent. solution of caustic potash may be first added. As the fibres are not very compressible they glide to the edge of the cover-glass and will probably be seen there in greatest abundance. Different from the bacillus, it is not easy to one accustomed to microscopic work to mistake these fibres or to confound other things with them.

One cannot say of this tissue, however, that it is only present in the spit of phthisis—other destructive changes in the lungs cause its appearance; but if seen, the supposition is strong that this is the disease with which we have to do, and the supplementary search for the bacillus will complete the diagnosis. It is also as strongly resistant to putrefaction as the bacillus, and Troup easily found both in a sputum sent from the antipodes. One of the photographs handed round showed how small a quantity is sufficient to attract the attention of a practiced eye. “Earnestly urging the importance of searching for elastic fibre in the very early stages of phthisis and in all cases where such suspicion is entertained I may have unduly magnified its diagnostic position, and may have failed to rehabilitate and restore its discovery to its former, and, as

I believe, its proper diagnostic rank. Many may dissent from my views; of course, one man's experience, however extensive it may be, is not all experience; but I can truly say that the microscope, by revealing to me the presence of curly fibre in a sputum, has, on not a few occasions, enabled me to know that a phthisis had begun when, had I trusted to my ears alone, nothing so grave and serious would have been apprehended; and conversely, to assert with well-founded confidence, that other cases were non-phthisical whose signs and symptoms pointed strongly to a contrary verdict."

Pharyngo-Laryngeal Signs.—Serrand ⁶²_{Am.} says that in patients destined to phthisis pulmonalis there are always some well-marked pharyngo-laryngeal signs which precede the pulmonary symptoms. These signs are three in number: 1. Pharyngeal anæmia. The pharynx is a pale, colorless white instead of its normal color. 2. Defective approximation of the inferior vocal cords from atony of the constrictors. 3. Localized congestion of arytaenoidal mucous membrane, shown by a swelling and a cherry-red coloring of that region. These three signs can exist together or singly. The existence of one is strong presumption in favor of approaching tuberculosis. Every time the physician finds them together the prognosis is certain. The pharyngeal anæmia, failure of the contractibility of the inferior vocal cords, the congestion of the arytaenoidal region, signs which have nothing in common with laryngeal phthisis, are the *avant-coureurs* of pulmonary consumption. The physician who can read the larynx of his patient may save him from many evils, for he can use prophylactic measures and arrest phthisis in its incipency.

M. Espinay Capo, of Madrid, ³_{Am.}, read a paper at the Congress for the Study of Tuberculosis on "The Early Recognition of Pulmonary Phthisis." The first thing necessary was to obtain a good history, to discover, if possible, the existence of tuberculosis in the family. Mensuration of the chest was of great importance. When the circumference of the thorax at the level of the axilla was less than twenty-seven inches, that at the level of the xiphoid cartilage was not more than thirty-one inches, and the distance between the nipples was but seven inches, the probability of pulmonary tuberculosis was very great. Further presumptive signs were absence of a clear percussion-note, inspiratory râles, altered respiratory rhythm, with prolonged inspiration and forced expiration, a dry,

paroxysmal cough, followed by a moist one, occasional aphonia, and dyspnœa on exertion. In doubtful cases, where there was spitting of blood, much assistance would be furnished by the sphygmograph in distinguishing between the hæmorrhage due to bronchial lesions and that dependent upon heart-disease. Another valuable aid in diagnosis was the thermometer; in a doubtful case an even-
ing rise to one hundred and two or one hundred and four degrees was a pretty sure indication of tubercular disease.

Diagnosis by Localization in the Lungs.—J. Kingston Fowler¹⁰¹³ has succeeded in demonstrating, in a manner that carries conviction with it, the not unimportant fact that in chronic phthisis the extension of the disease in the lungs follows a definite and regular course, and that any anomaly in this regular “line of march” must be attributed to some disturbing factor special to the case. His conclusions are based upon an extensive experience as pathologist to the Middlesex Hospital, and the adoption of a systematic method of examination of the lungs, whereby the relations and grouping of the lesions were readily displayed. He has thus arrived at results which, whilst in general agreement with accepted facts, go beyond these in many important particulars. Without attempting any detailed exposition of his facts, it must suffice here to say that Dr. Fowler clearly proves that the primary seat of disease is not the extreme apex of the lungs, but a point some inch and a half below this, and nearer the posterior than the anterior surfaces; or else, less often, at the outer part of the upper lobe corresponding to the first and second interspaces below the outer third of the clavicle. Of more importance is the proof of the fact that the apex of the lower lobe is liable to very early infiltration, as a rule, before the opposite lung is affected, at a time, that is, when physical signs first reveal the existence of disease in the lung. On the chest-wall this point corresponds to a spot opposite the fifth dorsal spine in the interscapular region. From these points there is gradual extension downward toward the base, and basic lesions, apart from such extension, are almost invariably non-tuberculous. The monograph contains further details of the distribution of such lesions and of the transference from one lung to the opposite, etc., and the explanation is given that the regularity of arrangement and sequence depends upon the tubercular disease spreading by inhalation, but that where the virus is disseminated

through the blood and lymphatic system no such regularity obtains. The bearing of such conclusions on diagnosis and prognosis is, therefore, obvious.

Eklund, our corresp. ed. from Sweden, ³⁸⁹_{Nov. '97} reports a case of tuberculosis in the base of the right lung following an attack of typhoid pleuro-pneumonia. The acute infectious diseases, especially whooping-cough, play an important rôle in the etiology of tuberculosis in children, although in adults they are not important. But it has been observed, after epidemic typhoid fever in Paris, that tuberculosis increased. This observation is confirmed by the following case:—

M. S., aged 20 years, parents tubercular, was sick with severe typhoid fever in August, 1886. The base of the right lung posteriorly was dull for a hand's breadth, pleuritis sicca-dextra. Percussion became normal in this region. Patient was weak and dyspeptic, with a pain in the right side, dyspnœa, cough, chills, and fever. Percussion became again dull from two fingers' breadth above the angle of the scapula to the base. The respiratory murmur was feeble in this region, "*Bruits à petites bulles.*" There was nothing abnormal in either apex. Albumen in the urine. Treatment: Cod-liver oil, extract of malt, atropine, etc. The condition grew worse and death supervened. At the autopsy large cavities were found in the lower lobe of the right lung, where tuberculosis had begun. The superior lobes of both lungs were free.

Eklund also quotes from N. Qvisling's article ³⁸⁹_{Aug. '98} on palpation as an auxiliary aid in the diagnosis of certain diseases of the lungs. By palpation the author understands a pressure exercised with a certain force in a definite direction. With the tips of the fingers a pressure is made in the intercostal spaces, in a plane perpendicular to the surface, beginning at the top in the supra-clavicular fossa, and passing from within outward. If there is positive disease the patient at once experiences pain from the pressure, which is in decided contrast to the sensation experienced at the apex of the other lung. The author believes himself authorized in regarding an increased tenderness in the superior intercostal spaces as a sign of the beginning of tuberculosis, and that a sensibility in the superior part of the lung, lasting through days, weeks, and months, is a very serious sign. He has never seen a case of incipient phthisis

in which this sensibility to pressure was not more or less marked. He also thinks that palpation is of a certain value in children between two and six years of age in making the diagnosis of acute croupous pneumonia situated in the apex of the lung. The author thinks this phenomenon due to a sensibility of the pulmonary parenchyma arising from the hyperæmia and transudation.

The Red Line on the Gums.—Dr. Georg Sticker³⁴_{Sept. 11} insists that the sharply defined red line on the gums, as remarked by Frédéricq and Thompson, is present almost without exception in phthisis, and that in youth it is among the first signs of the latent disease. Young people free from phthisis never show it. Associated with dyspepsia, chlorosis, erethismus cordis, it marks the diagnosis. The absence of it in young men, even with the presence of the signs above mentioned, excludes the disease.

Prophylaxis.—The prevention of phthisis pulmonalis, that is, of the pulmonary localization of tuberculosis, the main expression of the disease, consists solely and simply in the destruction of the sputum of tuberculous patients. Invigoration of the body is, of course, of great value, but really is of secondary importance; for, no matter how fertile the soil, the disease cannot develop without the seed. Koch has demonstrated absolutely that tubercle bacilli never develop or multiply outside of the body of animals. Hence the destruction of the sputum is the practical extirpation of the disease in so far as it attacks the lungs. Celli and Guarnieri, Kümmel, Müller, Charrin and Karth, Sirena and Pernice, Cadéac and Malet, have all abundantly proved that the air expired from the lungs of phthisical patients never contains bacilli or spores. Neither ever arise from moist surfaces. Desiccation is a *sine qua non* to effect the dissemination of tubercle elements. Wet weather, much moisture in the air, is enough to confine them to the surface. The best conditions for drying and dispersion are found within the walls of a house. “A phthisical patient should never, therefore, under any circumstance, expectorate on the floor or in a handkerchief, but always in a sputum cup.” This quotation from Cornet⁵⁸_{Nov. 21} sums up the prophylaxis of tuberculosis absolutely. The sputum cups need contain only water and be frequently emptied into sewers, where decomposition, sooner or later, destroys the bacilli, or, at all events, puts them out of reach of inhalation by man. Individual sputum cups are to be preferred

to cuspidors, which should also abound. Not only does the patient protect others in this way but also himself, as he otherwise continually reinfects himself by reinspiration of bacilli and spores into, as yet, unaffected bronchi. Kissing, the use of the same dishes, etc., are to be avoided. Tuberculous mothers and wet-nurses should, of course, cease to nurse infants. Milk, as stated, should be boiled. The floors should be sprinkled with water before being swept. All sweepings should be burned. Clothing and bedding of tuberculous patients, covered with or containing sputum, should be burned or properly disinfected by steam. Cornet found feathers still infectious after subjection to cleaning by ordinary methods six times in six successive cleaning establishments. Walls should be periodically rubbed down with bread. Rugs and curtains should be shaken in the open air at a distance from houses.

Life in the open air is the true preventative of tuberculosis, premising the destruction of the bacillus as far as may be in the sputum and in meat and milk, as already sufficiently emphasized. On this subject W. Matthews, U.S.A., read a paper¹⁰⁴² before the American Climatological Society, September 20th, showing that the rate of consumption, especially scrofulous, among the Indians is high and is increasing, which may be accounted for by the change of life among those who have given up their wild life and are living on reservations. This fact is bitterly emphasized by the mortality statistics of prisons. Thus, in Millbank Prison, in England, between the years of 1825 and 1842, 12 per 1000 died of phthisis, whilst in the city amongst the free population of the same age the mortality was only 4.37 per 1000. In the years named 205 prisoners died, 83 of whom died of phthisis, and in addition to these 90 others were discharged on account of advanced tuberculosis. The same holds good in the Prussian jails. In that of Plötzensee, between the years 1873 and 1882, 139 prisoners died, of whom 91 (65.4 per cent.) died of phthisis and 40 others were discharged before the expiration of their sentences on account of the disease. This state of affairs recurs in almost all jails. With relatively good hygienic conditions and a relatively very low general mortality, this enormous mortality from phthisis! And even these statistics of disease are not sufficiently high, as the autopsies on the prisoners dying of other diseases show more or less advanced

tuberculosis in them also; so that Baer, as a prison medical officer, gives it as his opinion that a non-tuberculous condition of the lungs of people dying in prisons is infrequent—that it is to be looked upon as an exception to the rule.

In estimating the causes of this disposition to phthisis one point comes into consideration: It is not the prisons and penitentiaries in which prisoners breathe the impure, common air of work-rooms and dormitories that have the highest mortality from phthisis, but the cell-prisons, and this in spite of the separation of the healthy from the diseased, and in spite of the facts that the relative cubic space in each cell is greater than that in the common rooms and that the air, floor, and walls are kept much cleaner. Here the infection with the ubiquitous tubercle bacillus can really depend only on the individual being shut out from the outer air and from muscular exertion in the open air. That the food is monotonous and often insufficient may not be disputed. The psychical factors, also, of loneliness, *ennui*, remorse, and the longing for freedom are not to be underestimated.

These considerations deserve the attention of the authorities, since the etiological factors are so clear that a change in the employment and the enjoyment of fresh air, as the most essential influences in the avoidance of the disease, are not to be overlooked. The possibility of a change of the existing rate will not be contested by anyone who is acquainted with the enormous improvements that have taken place in prison hygiene during the last fifty years. Ziemssen⁴⁰⁴ comments also, in this connection, on the gradual deterioration of health and development of phthisis among the Sisters of Charity in the Munich Hospital, 50 per cent. of whom die of tuberculosis. The young maiden "candidates" come into the order from the country, rosy-cheeked and robust, to show in the course of a few months that distressing anæmia which is usually the forerunner of spitting of blood, and to fall, one after another, victims of phthisis. It is certainly absurd, the author says, to claim that all these young, fresh, country girls carry with them a hereditary tendency to the disease. Imprisonment for ten to fifteen years, this author says, is condemnation to death by phthisis.

Trudeau^{9 Oct. 27} confirms these views in what he calls "environment experiments," which consisted in inoculating two sets of rabbits

with tuberculosis, confining one set in dark, damp, subterraneous places and allowing the other set to run free. The confined set quickly succumbed to the disease, or when killed were found to be extensively affected, while the free set either recovered or when killed were found to show but slight lesions.

Treatment.—The contributions of the year have only emphasized the impotence of medical science as yet to combat the disease directly. The true treatment is prevention, which is, as has been shown, not difficult and entirely practical. The hope which sprang up at once in the mind of every clinician, and which was even expressed at the start by Koch himself, that practical results would naturally issue from a knowledge of the cause of the disease, has not been realized as yet. Tuberculosis pulmonum, at least, remains as intractable as before, and the natural issues have been hitherto in direction of prophylaxis, diagnosis, and prognosis rather than in that of treatment. It is, in fact, now quite universally conceded that the chief, if not the whole, benefit of sojourn in high *altitudes* rests not upon any destructive action of rarefied air upon the bacillus tuberculosis, but upon purity of the air and the increased pulmonary exercise incident to these places. That dryness of the air is not the main element is proven by the fact that the same immunity of attack is enjoyed by the inhabitants of mountain valleys about lakes and canals as in arid regions, provided the elevation be the same, and that freedom from contamination is not the main element is proven by the exemption of the factory workers in cities like Quito, Bogota, Chuquisaca, Cochabamba, Potosi, etc., with populations varying from seven thousand to seventy thousand souls living in the most unhygienic, often filthy, surroundings, but at elevations from eight thousand to twelve thousand feet above the sea. At nine thousand feet above the sea, the air is diluted one-third in volume and the necessary demands of the body impose upon the organs of respiration and circulation three times the work performed at the level of the sea to accomplish the same purpose. Hirsch quotes from Boussingault an exclamation of wonder at the observation of the muscular strength and skill of the bull-fighters at Quito, nine thousand feet above the level of the sea, and at the endurance of delicate young women in dancing all night, at elevations where the celebrated Saussure had hardly

strength to make observations from his instruments, and where hardy Alpine guides fell into syncope at the effort of digging a hole in the snow. Yet the celebrated battle of Pinchincha was fought out by the natives of this height. Brehmer¹⁰¹⁴ fixes the necessary height at the elevation in which the natives enjoy immunity from the disease thus: In Middle Germany, at least fifteen hundred feet; in Switzerland, four thousand five hundred to five thousand feet; and at the equator, ten thousand to seventeen thousand feet.

The recent discussion at the Royal Medical and Chirurgical Society⁶ upon the influence of residence at high altitudes upon phthisis brought into strong relief both the high value attached to this line of treatment by some eminent authorities and the utter skepticism with which it is regarded by others. Williams, Weber, and Emart spoke in strong support of the mountain cure, while Pollock and Quain did not hesitate to declare that the cases which do well at Davos and other high-altitude sanatoria are precisely the cases which do well in England, and that the element of altitude is practically without influence upon the result. The discussion arose out of a communication from Dr. Williams in which he detailed the results of treatment in one hundred and forty-one cases of phthisical patients who had resided at high altitudes. The results were certainly surprising and gratifying. In 14.13 per cent. of cases the restoration to health was complete, in 29.78 per cent. there was great improvement, 11.34 per cent. were more or less improved, while only 17.02 per cent. deteriorated, including 13.47 per cent. of deaths.

The agents most lauded as specifics in the past year have been iodoform, abandoned as a specific since Trudeau succeeded in cultivating tubercle bacilli in solutions of it; sulphuretted hydrogen by inhalation or rectal injection, which may relieve the associated catarrh but has no antimycotic action whatever; inhalation as well as internal administrations of menthol, thymol, carbolyzed iodine, also used in parenchymatous injection, creasote, and hydrofluoric acid. Of these the only agents which have stood any test at all are the last two.

Creasote was first introduced by Bouchard in 1877, and has been lately extensively employed by Sommerbrodt^{1, 2} and Fräntzel. Diminution of cough and expectoration, reduction of

fever, increase of appetite and weight, and clearing up of consolidations are the virtues claimed for creasote by these observers. It is best given in capsules with the balsam of tolu or with tincture of gentian and sherry wine. The best results are obtained only by individuals who will patiently persist in the use of the remedy from six to eighteen months. Von Brunn⁴ has treated one thousand seven hundred cases of phthisis with creasote in eight years, and with good results. The cases were both ambulatory, in which there was but little rise of temperature and active tuberculosis. The best results were had in acute cases in which the temperature became almost stationary after a period of fever, and in which, as a rule, the lesion was catarrhal and unilateral. He thinks it unwise to give less than six or seven drops of creasote a day; he has not given more than seven drops and thinks it necessary to continue treatment for several months. The more creasote the patient can bear the better, he thinks. He uses the creasote wine originally prescribed by Bouchard:—

Creasote,	18 parts (2. grammes) (M 31).
Tr. gentian,	30 " (4.66 ") (M 72).
Alcohol,	250 " (38.88 ") (3 10).
Tokay or Malaga wine, ad 1000	" (155.52 ") (3 5).
One teaspoonful well diluted with water three times a day.	

Dr. Rosenbusch, of Lemberg, collaborator of the ANNUAL, sends an account of the cases of nine phthisical patients whom he treated by *injecting creasote* into the tissues of the lung. The results he obtained were excellent. The injections, which were given at intervals of two or three days, caused the cough almost to disappear and the quantity of sputum to diminish. In those cases which were not very far advanced the patients gained flesh, the dyspnoea and sweats ceased, the body-weight increased, and numerous spots which had been dull on percussion cleared up. The temperature decreased from five to eight hours after the injections, the fall continuing at first for ten or twelve hours, a permanent normal temperature being subsequently registered. The injections were made into the affected portion of the lung, which was usually the apex. The instrument employed was an ordinary Pravaz syringe, with a needle from six to eight centimetres in length. About eight drops (half a syringeful) of a 3 per cent. solution of creasote in almond oil was injected in each of two spots, the piston of the syringe being pressed down slowly. The

patient was told not to breathe deeply and after the injection to lie quite still for a few minutes. When the needle was not inserted deeply enough, some lancinating pain was apt to be produced by the irritation of the pleura. This, however, did not last long. No hæmorrhage was ever observed after the injection, though in the case of one patient who was subject to hæmoptysis a slight coloring of the sputum was observed for a short time. If the injections were made into a cavity or into one of the large bronchi the patients said they could smell creasote when they coughed, and this substance could be detected in the sputum by chemical means. Of course, great care was taken to perform the operation under aseptic conditions, the skin, the needle, and the syringe being previously carefully washed with an antiseptic. The creasote used was the *creasotum e bitumine fagi*, or beech-creasote.

T. Stachiewicz, of Görbersdorf,⁶ has followed up the attempts to arrest tuberculosis by deep injections of creasote into the substance of the lung which met with such favorable results in the hands of Rosenbusch, but without being able to show nearly such good effects; indeed, in one case, fever and hæmoptysis came on and the cough and expectoration increased. Notwithstanding his unpromising results, Stachiewicz is disposed to think that intrapulmonary injections of creasote may, perhaps, be of service where the cavities are superficial or where there are hydatids or gangrene of the lung, and he suggests that it may, perhaps, be resorted to in some desperate cases of phthisis merely as a last resort. Rosenthal, of Königsberg,⁴ administers it in the form of mineral water containing the drug in gradually increasing strength, with, at times, a gain of weight of three to thirty pounds in the first few weeks.

Strümpell²²⁴ sums up the value of the drug with the remark that most of the patients praised its effect on the cough, sputum, and appetite, "but that little dependence can be placed upon the sanguine expressions of consumptives." The drug was at times borne well by patients with intestinal tuberculosis and diarrhœa, so that the latter is not always a contra-indication. No favorable effect on intestinal disturbances could be observed. "Taking it all in all, we find that creasote, even in large doses, has no injurious effect in tuberculosis. At times we notice an apparently favorable *symptomatic* effect. We failed, however, to observe

any real influence exerted by creasote on the progress of the disease."

In experiments by myself with creasote, which extended over nearly a year, the dose was increased one drop a day to fifteen drops at a time, and in one case the increase was continued to forty-drop doses three times a day. Several patients also inhaled atomized pure creasote in the pneumatic cabinet. In all cases the preparation used was the pure beech-tar creasote imported directly from Merck's laboratory at Darmstadt. That good results were obtained in the long use of the remedy there is no doubt, but that these results are due to any direct antimycotic action of the drug is doubted from the fact that relapses of fever with cough, occasional night-sweats, etc., recurred at longer intervals, perhaps, but, nevertheless, continuously. Cornet⁵⁸_{Nov. 21} attributes any good results observed to the diminution of secretion, whereby chance of reinfection or auto-infection is lessened.

As is known, some time ago Seiler and Garcin, of Paris,¹⁰₁₈₈₇ published a remarkable paper on the treatment of pulmonary tuberculosis by inhalation of *hydrofluoric acid*. According to their statements, out of one hundred patients under their care who were treated by this method as many as thirty-five were cured, and forty-one showed a more or less considerable improvement, while fourteen remained unbenefited and ten died. In favorable cases the authors observed a very rapid improvement, both in point of appetite and sleep, and a marked diminution of fever, night-sweats, and dyspnoea, while expectoration became scanty and less viscid, the tubercle bacilli gradually disappearing.

Being struck with these results, de Giacomi, of Berne,²¹⁴_{Mar. 1} proceeded without delay to test the treatment in eight advanced cases of his own. He simplified the Seiler-Garcin method in so far that a mixture of one hundred grammes (33 32) of fluoric hydrogen with three hundred grammes (39 35) of water was heated in an open leaden vessel by means of a spirit-lamp. The patients sat around the vessel and inhaled the vapor for an hour daily. Dr. de Giacomi's experience was not so favorable as that of the French observers. In six of the eight patients the result was absolutely negative; in a seventh some temporary improvement of appetite and decrease of dyspnoea were observed; in the remaining case a striking relief of all symptoms ensued after the very first sitting.

The author, however, reasonably enough, hesitates to attribute such an extraordinary and sudden change to the treatment employed; the improvement might have been purely accidental. At all events, he thinks that the method deserves a further and more extensive trial. The inhalation does not cause any discomfort to the patient. The only drawback which he mentions is that window-panes gradually become opaque under the influence of hydrofluoric vapors. As the acid has a violent caustic action on the skin, he recommends the utmost caution in manipulation with the solution. Dr. Collin employed the method in two cases of advanced tuberculosis with high fever and extreme emaciation, and did not see any good beyond some amelioration in respect to sleep. Gager⁶⁹_{p. 507} details his experience with seventeen cases treated in this manner. In five of these the tubercle bacilli disappeared from the sputum and there was also decided improvement of the condition of the lung, as shown by physical exploration. In seven cases there was more or less improvement in these physical signs; in twelve cases an increase of weight was noticed; in seven cases there was a gain of from one hundred to six hundred cubic centimetres in vital capacity. Of three patients who had fever, one lost it entirely and another partially. In one instance night-sweats ceased. In five cases there was no result. In no instance did the drug produce unpleasant effects, except in the patients with tuberculosis of the larynx, where it exercised a distinctly irritating action on the mucous membrane of that part.

Grancher and Chautard, of Paris,⁵⁹_{Oct. 6} instituted a series of experiments on the action of hydrofluoric acid in tuberculosis. These experiments practiced on rabbits inoculated and with variable degrees of dilution have given appreciable results with only a certain degree of concentration—inhalation at 60 and 80 per cent. The following are the conclusions of the authors: "It would appear that these experiments do not justify all the hopes that observations of favorable cases in human species had given rise to, unless, by an indirect action on the secretions and on nutrition, the vapors of hydrofluoric acid favorably influence the progress of tuberculosis. We do not believe that one can legitimately hope to reach and destroy in the depths of the economy, by vapors of hydrofluoric acid, the tubercle bacillus which these same vapors attenuate but do not kill after a contact prolonged for more

than four hours." But, add the authors, "all attempts to combat the agent of pulmonary phthisis are legitimate, and the vapors of hydrofluoric acid which are well tolerated by the greater number of patients are, at least, a means of attenuation if not of the destruction of the tubercle bacillus. Trudeau⁹ says that in the treatment of the existing lesions of pulmonary phthisis the hydrofluoric inhalations would at least possess, over the antiseptic sprays already in use, the advantages of tested efficiency and greater penetrability. It is evident, however, that even if the acidulated air could be breathed without injurious effects in dilutions which have been found to be efficient, but a small proportion of the bacilli, namely, those lying directly in contact with the atmospheric air, could thereby be destroyed, while no antagonistic effect on those imbedded in solidified areas of the lung, tubercular nodules, or diseased glands could be hoped for. Professor Jaccoud read a note⁶ on his experience of the action of hydrofluoric acid on the bacillus of tuberculosis at the Paris Academy of Medicine. Guinea-pigs inoculated with the sputa of phthisical subjects all succumbed to tuberculosis, but those which had been inoculated with sputa modified by the action of hydrofluoric acid had equally contracted generalized tuberculosis. He selected this mode of procedure as it is comparable to therapeutic inhalations, although much more powerful on account of the immediate contact of the vapors with the bacilliferous matter. He had caused other experiments to be performed by his *chef de clinique* and under his directions, assisted by two *chefs de laboratoire*, from which he felt himself justified in concluding that hydrofluoric acid does not in any way modify the virulence of the bacillus of Koch. Bucquoy³ from his observations considers any specific action "*absolument nulle*," a view generally concurred in by the Paris Congress, wherein the general conclusion arrived at was that the inhalations were of little or no value in destroying the bacilli, but that under their influence an amelioration in the general state of the patient and a diminution of the expectoration took place. As for the administration of the acid by the stomach, its medicinal properties are similar to those of hydrochloric acid—that it is a refrigerant, antiseptic, and tonic, but it has no specific action on the bacilli imbedded in the tissues of the lungs or elsewhere.

Bartholow⁵ says the method of *rectal gas injections*, devised

by Bergeon, can be judged in a more logical manner than was possible during the existence of that epidemic enthusiasm which swept the universal medical profession a few months ago. A research carried on in Pressberg General Hospital by Pavai-Vajna,¹⁶⁹_{Dec.} may be summed up in the following statements: Bergeon's treatment has no action on the bacillus. It has little influence over the local morbid process, nor does it prevent further infiltration of the pulmonary parenchyma. It does moderate the cough, lessen the fever, heat, and sweats, increase appetite and digestion, and thus promote constructive tissue metamorphosis. It has no important advantage over the treatment by suitable hygienic arrangements and the administration of creasote, according to the method of Sommerbrodt, Fräntzel, and others, especially the subcutaneous administration of the medicament. Billings,²³¹_{June} of Chicago, stated before the Illinois State Medical Society that the expectations regarding the remedy have not been realized. The treatment has been thoroughly tested in the United States, and the almost universal opinion seems to be that it exerts no curative influence on the tubercular process, but does have a palliative effect, diminishing the sputa, relieving the cough, night-sweats, and thoracic pain; improving the appetite, and, consequently, the strength of the patient. These favorable conditions are only temporary, however, and a time comes when the injections cease to have a good effect. Brehmer,⁶⁰_{Mar. 15} entirely coincides with this view.

Davies,⁶⁷_{Feb.} discusses at some length the method of preparation and inhalation of *sulphurous acid* in phthisis. He alleges the usual good results for this form of treatment. The cough, expectoration, and night-sweats cease, the patient gains in flesh, and the physical signs show that the lesions are undergoing improvement.

M. Deschiens,⁶⁷_{Feb.} has introduced sulphur candles, which, on being burned, generate a certain amount of sulphurous acid gas. He has invented also an ingenious lamp for the combustion of sulphur, and which indicates the quantity of gas given off.

Whittaker,¹⁰¹⁵_{Jan. 15} reported concerning the use of the essential oil of garlic and the oil of black mustard, which gave results similar to those following creasote and guaiacol.

An Italian physician, Dr. Bertalero,⁶_{Feb. 2} bears testimony to the value of *aniline* inhalations in the treatment of phthisis. He has published eight cases in which he has employed them with excel-

lent results. The apparatus he used was not an inhaler such as used by Kremianski, but a Siegel's spray charged with aniline. He also gave it internally, not, as Kremianski advises, in the form of antifebrin—i.e., acetanilide, which gives off aniline in the body—but as pure aniline itself. Billings²³¹_{June} had used the treatment in two cases with absolutely no benefit. M. P. Seslarin¹⁰¹⁶_{No. 22} reports that he has made a trial of Professor Kremianski's system of aniline inhalations on some cases of phthisis in the military hospital at Tiflis, taking care that the surrounding conditions should be as favorable as possible. From one hundred to three hundred inhalations of aniline were taken daily, also from five to fifteen grains (0.32 to 1 grm.) of acetanilide, or antifebrin. In no case was any improvement observed; the number of bacilli in the sputum did not diminish; the disease, on the contrary, made further advances. The cough did not always diminish, and very frequent signs of the toxic action of the aniline on the heart's action were present.

G. Martell,⁸⁴_{July}, of Breslau, has for three years studied the action of *calomel* on tuberculous processes, and has come to the conclusion that it must be recognized as the best adapted specific antiseptic in the treatment of tuberculous conditions. A. Dochmann¹¹⁶_{Sept.} says that in his experience calomel has a rapidly favorable action in the ordinary forms of anæmia, even in cases where iron has been without effect. It increases the appetite, removes habitual constipation, and regulates menstruation, persistently delayed. These views stand in marked contrast with the experience of a thousand years summed up by Cullin with the statement, "Mercury is pernicious in consumption."

Drs. Miguel and A. Rueff, of Paris, have published a work⁶_{Nov. 2} on the treatment of pulmonary tuberculosis by sprays with the *binoxide of mercury*. The experiments of Dr. Miguel having shown him that the binoxide of mercury is microbicide in solutions of 1 in 400,000, he was induced to try it against pulmonary phthisis, and this he has done in conjunction with Dr. Rueff. They have established spray apparatus at the Rothschild Hospital, and have submitted phthisical patients to the vapors of the binoxide of mercury. Of twenty-seven patients submitted to this treatment, nineteen were improved and eight remained stationary. The improvements were, therefore, at the rate of 70 per cent. In these cases attenuation of the pulmonary lesions were obtained, and

particularly diminution of the expectoration and increase in the weight of the patients. In two cases even the disappearance of bacilli was established.

A. Fillcau and Léon Petit,⁶¹_{Sept. 1} record the benefits obtained from the subcutaneous injection of *carbolic acid* in pulmonary phthisis. Ceccherelli,³_{May 5} demonstrates the antituberculous action of *tannin*. Tuberculosis was developed in a certain number of animals by the injection of saliva or other liquids containing tubercular bacilli. Simultaneous injections of tannin left the animals in good health. The same phenomena were noticed in animals which were made to take tannin in daily doses. Ceccherelli also related twenty observations on patients of his clinic who had been treated with tannin locally and internally in which it acted with good result.

Fränkel,²_{Mar. 21} who has repeatedly advocated the use of creasote in the treatment of phthisis, now recommends *guaiacol* as the effective constituent of creasote. The good effects of the latter are, Fränkel thinks, after nine years' experience of its effect in phthisis, unmistakable in a strictly defined class of cases. If used promiscuously in this disease its good effects are distinctly evident in sixteen or twenty out of four or five hundred cases, and are due not to destruction of the bacillus tuberculosis but to its favorable influence on digestion.

Ransome,²_{Mar. 3} at the Manchester Medical Society, Feb. 10, presented some notes on the treatment of phthisis by pure *oxygen* and *ozone*. Pure oxygen prepared by Brin's process had been supplied by that company and had been largely administered, but without very definite results until it was ozonized and administered under pressure by means of Waldenberg's apparatus. Beneficial results had then been obtained in three patients, who carried on daily inhalations for from three to five weeks.

Rovsing,⁶_{Jan. 21} of Copenhagen, has found that the growth of tubercle is in no way retarded by the presence of a very considerable quantity of *iodoform*. He has more than once inoculated the two eyes of a rabbit with pure and iodoformed tubercle respectively, and has invariably found that the morbid process was communicated to the eye containing the iodoformed tubercle some time before the other was affected, the irritation produced by the iodoform in the tissues appearing to cause them to form a more suitable soil for the development of tubercle than those of the other eye, which were not similarly exposed to irritation.

Debove,¹⁷ recommends *talc* (silicate of magnesia) in the treatment of obstinate diarrhœas of tuberculosis.

Piermy,¹⁰⁴ stops night-sweats with *agaricine* in a dose of $\frac{3}{8}$ of a grain (0.003 grm.) or more.

Halter,⁴ recently published a paper on the immunity of workmen employed in lime-kilns from pulmonary consumption, in which he makes some suggestions for the treatment of that disease. He says that he has been struck by the fact that in a country district which otherwise showed a large number of deaths from consumption, the workers in lime-kilns had, without exception, been exempt from phthisis during fifteen years. The fine chalk-dust which they inhale is, according to him, as little important as the dry soil on which they live. The essential thing is the *hot, dry air* which they constantly breathe. The temperature in which they work is from 122° F. (50° C.) to 156° F. (69° C.). The relative moisture of the air never exceeds more than 50 per cent., so that the air there is similar to that of places famous for their climate, such as Davos, Denver, San Remo, Cairo. The most favorable temperature for tubercle bacilli is between 98.6° F. (37° C.) to 100.4° F. (38° C.); they die at 105.8° F. (41° C.). Halter, therefore, thinks that a high temperature of the inspired air might warm the air in the lungs sufficiently to prevent the growth of bacilli in them. He found by calculation and experiment that inhalation of hot, dry air of 248° F. (120° C.) to 256° F. (123° C.) raised the temperature of expired air to about 109.7° F. (43° C.); that is, to a degree of temperature in which the tubercle bacilli perish.

Weigert, of Berlin, is disputing with Dr. Halter the priority of this suggestion. The dispute is still further complicated by a publication,⁴ in which Dr. E. Krull, of Güstrow, states that for more than two years he has made similar experiments, although he made them with damp air. The temperature of the inhaled air in Krull's experiments was not higher than 50° C. (122° F.), and yet the temperature of the expired air was not less than 42° C. (107.6° F.), a degree of heat which is fatal to the tubercle bacillus. His results were satisfactory principally in cases of incipient phthisis.

Per contra, as the bacillus tuberculosis is only developed at a temperature above 37.5° C. (99½° F.), Worms, of Riga,²¹ recommends inhalations of *cold air* in phthisis. The patient, protected

from the wind, should deeply inhale the external air through the mouth during the greater part of the day. During the night the room is to afford limited access of cold air. Loss of heat by the skin is to be prevented by clothing; at the same time abundant albuminous and oleaginous nutriment and some alcohol are to be given; physical exercise and pulmonary gymnastics are to be recommended. Unfortunately, there are no statistics to support the author's theory.

In commenting upon these two suggestions, Bringer observes, satirically: "Having sent patients to the tropics, we next send them to the arctics, whereupon we countermarch them to a temperate zone, where they may find the comforts of life."

The therapy of tuberculosis pulmonum may be concluded with an abstract from the paper of Cornet,⁵⁸ in which he says his object is to see whether by saturating the system of guinea-pigs with various medicinal substances he can prevent or retard the development of tuberculosis. The materials employed were tannin, acetate of lead, garlic infusion, pinguin, hydrogen-sulphide water, menthol, solution of corrosive sublimate, 1 per cent. solution of creolin, large doses of creasote. None of these, though given in doses such as would never be employed in practice, appeared in the least to retard the progress of the disease. He does not consider himself justified in applying these observations to man, believing that he himself has observed improvement in numerous cases of human tuberculosis from the employment of creasote. Twelve guinea-pigs were infected, half of them by inhalation and half by subcutaneous inoculation. Six of them were then sent to Davos and the remaining six were kept at the Hygienic Institute of Berlin under precisely similar circumstances. All died of general tuberculosis, without distinction as to the time of death or their pathological condition.

But the possibilities of the future are illustrated in a statistical report of Vibert,⁶ who, in looking over the register of the necropsies made at the Paris Morgue, "was struck by the fact that in one hundred and thirty-one individuals of from twenty-five to fifty-five years of age, having all succumbed to violent or sudden deaths, it was noted that the existence of pulmonary tuberculosis was recognized in twenty-five, in seventeen of whom the malady was in a cretaceous or fibroid state; that is to say, of tubercles cured."

PNEUMONIA.

Etiology.—The work of the year has distinctly emphasized the causative rôle of the diplococcus of Fränkel⁹, in croupous pneumonia, yet it has been also shown that other micro-organisms may account for exceptional cases. We consider it safe to conclude, therefore, that lobar pneumonia has not yet been finally resolved; that there are various forms of the disease undistinguishable as yet by physical signs. Clinical medicine has long since separated primary and secondary pneumonia. The pneumonia incident to typhoid fever, scarlatina, small-pox, dysentery, and other infectious diseases shows a character and course quite different from the primary acute croupous disease.

That secondary pneumonias may be readily explained by invasions of the lungs with the micro-organisms of these diseases is quite certainly established, at least for typhoid fever. Other cases admit of explanation on the ground of mixed infection. Thus suppuration is not a natural termination of acute croupous pneumonia. Suppuration means a coincident or subsequent invasion of the lungs by the organisms of pus. Omitting all these cases, we have left pneumonia proper, which can certainly be produced by the diplococci of Friedländer and Fränkel. Whether these pneumonias differ in their character, or what fine differences they present, we know not as yet, but we do know clinically that acute croupous pneumonia has a classically typical course. Few other infections, Baumgartner⁴⁰² declares, “present a course so uniform and so regular. It is, therefore, safe to assume, as in the case of other infectious diseases of uniform course,—typhoid fever and erysipelas, for instance,—a single, sole cause in the production of pneumonia.” That this cause has been discovered in Fränkel’s micro-organism can now be declared established, for the bulk of recent testimony lies certainly in this direction. Then, to speak only from a clinical stand-point, this organism is most uniformly found in the sputum of perfectly recent cases or in the first days of the disease, a fact which gives it supreme value from the point of view of differential diagnosis. Thus, in the examination of seventy successive cases, Wolff⁶⁴⁹ found Fränkel’s diplococcus sixty-six times—i.e., 94 per cent. The examination was negative in but a single case. Verification was established by cultures in more than half the cases.

The most noteworthy publications of the year are by Weichselbaum and Monti, from examinations made during life as well as after death. Weichselbaum⁸⁴_{Oct. 11} writes on the rarer localizations of the pneumonia virus (*diplococcus pneumoniae*) premising that the *diplococcus* of Fränkel is not the only cause of pneumonia, as it is seen that that of Friedländer may also cause exceptional cases; he confines his remarks, however, to the *diplococcus* of Fränkel. Bouilland and Legroux, in 1835, and Herschel, in 1865, had described a pneumonia endocarditis, and various clinicians had remarked upon the coincidence of meningitis. Senger found and cultivated peculiar cocci in pneumonia, endocarditis, meningitis, and nephritis. Cornil and Babès discovered them, but failed to cultivate them, and Fränkel, Foà, and Bordoni-Uffreduzzi, and the author furnished the proof that the cause of pneumonia is not confined to the lungs, but involves, also, other organs and tissues. Thus, Weichselbaum found the *diplococcus* after pneumonia in the ventricles of the brain and in the œdematous effusions in the loose connective tissue of the mediastinum, the jugulum, about the clavicle, behind the œsophagus, and in all the cavities about the nose, and cultivated it from the serum of the pericardium before any visible signs of inflammation presented. Netter disclosed pneumococci in autopsies upon pneumonia patients, also in the drum cavity, and in the labyrinth as well as in the upper cavities of the nose. Zaufal also cultivated pneumococci from the secretion of otitis media complicating pneumonia. Mircoli, Livierato, Nauwerck, and others made the same or similar discoveries.

It is seen, therefore, that this *diplococcus* produces various processes either coincident with or entirely independent of pneumonia. The author next relates cases of meningitis, cerebral and spinal, and encephalitis, from the fluids of which he cultivated the *diplococcus* of pneumonia. Fränkel cultivated the *diplococcus* from the fluid of pleurisy and empyema complicating pneumonia, as well as from the fluids of these diseases independently of pneumonia; that is, from primary affections.

The most interesting and suggestive part of Weichselbaum's studies is the discovery of the *diplococcus* in all the cavities about the nose, a discovery verified also by Gruber, Netter, and Zaufal. Endocarditis and suppurative arthritis furnished at times the same organisms, which have been found also in the brain, cord, pleura,

pericardium, interior mucosæ, and submucous tissue, as the cause of disease in all these organs. Testimony accumulates (Goldsmith, Neumann, Schaffer, Foà, and Bordoni-Uffreduzzi, as well as that of the author) to show the dependence of epidemic cerebro-spinal meningitis upon the same cause.

Regarding pneumonia proper, Weichselbaum thus sums up his conclusions: 1. The bacteria found in different forms of pulmonary inflammation are regarded as the cause of them. This conclusion is completely justified on the following grounds: Definite, well-characterized species of bacteria not only occur constantly in acute pulmonary inflammations, but can be demonstrated in greatest abundance and activity in the earlier stages of inflammations. They have been isolated, cultivated, and, when introduced into certain animals, have produced processes which, taking them *in toto*, correspond to inflammation of the lung in man. 2. The pneumonic virus is no unity, inasmuch as acute pulmonary inflammations, even croupous pneumonia proper, can be produced by different kinds of bacteria. In this the pneumonias recall acute inflammation of the connective tissue, in which also several species of organisms occur. 3. The separation of pneumonias into lobular and lobar, croupous and non-croupous, has an anatomical but no etiological significance. Moreover, the so-called secondary pneumonias, etiologically considered, are not secondary. 4. The diplococcus pneumoniae is to be regarded as the most frequent exciter of inflammation of the lungs. Friedländer's bacillus organism but rarely causes croupous pneumonia. Catching cold has only a possible predisposing effect.

Monti⁸_{Mar. 11} reported the examination of twenty cases clinically and bacteriologically. He had in every case withdrawn exudation by means of Koch's syringe from the lungs during life. In only one case did he find a negative result. In all others he always found a micro-organism, which, when cultivated on agar, showed itself to be the diplococcus capsulatus of Fränkel-Weichselbaum. Sometimes it was found alone, or again in company with other organisms, namely the staphylococcus pyogenes aureus (three times), the streptococcus pyogenes (once). Friedländer's micrococcus never showed itself at all. Inoculation of fifty-nine rabbits with the sputum was universally successful, but produced the typical pneumonia only when introduced into the trachea. Inoculation under

the skin produces septicæmia; into the pleura, pleuritis and pericarditis, but never pneumonia. Inoculation of the dura mater in a dog after trephining produced meningitis and typical lobar pneumonia. Pure cultures were obtained from the lung of this dog. In one case of primary cerebro-spinal meningitis the same diplococcus was found in the exudation, so that the same micro-organism can produce both diseases.

Contagion.—According to Netter³⁹⁰_{July} pneumonia is a transmissible, contagious disease. The contagion is due to specific, pathogenic micro-organisms, which multiply in the diseased focus, and which, leaving the body in various ways, are especially abundant in the products of expectoration. Contagion from the sick is still possible long after recovery, and for two reasons. The first is, the contagion resists desiccation and may thus preserve its activity outside of the body on different substances to which it adheres. The second reason is, that the contagion is not destroyed in the patient after the termination of the disease, as are most infectious germs. Long after recovery, perhaps indefinitely, the subjects of the disease have in their mouths active germs, and this activity explains the great number of recurrences in pneumonia and the occurrence of multiple outbreaks in one family or house.

During the Polish Congress at Lemberg, Jaworski and Chrostowski⁶¹_{Dec. 1} mentioned a small epidemic of fibrinous pneumonia observed by them. There were five cases of the disease in one house. The patients had been employed in cleaning out a ditch. It was found that the house in which these cases occurred had not been free from pneumonia since 1860. The pneumococcus of Friedländer [?] was found in the exudation taken from the lungs of these patients by means of the needle of a Pravaz syringe and also in the earth of the ditch mentioned. Kuhn⁴_{Apr. 23} reports a pneumonic infection series affecting an old man, aged 76, his wife, aged 72, the daughter, aged 40, all of whom died, and the son, aged 32, and his child, aged 6 months, who recovered, all within five or six days. A. Ross Matheson¹⁵⁷_{Apr.} reports three cases of double pneumonia occurring simultaneously in one family. Childs also¹⁵⁷_{Apr.} is reported to have had a similar experience with cases confined to one lung. Wagner⁵_{July} had previously reported a series of cases of pneumonia of a typhoid type occurring in certain individuals from the same business house occupied in the importing of pet animals, one of

which animals had died of pneumonia. Since then he treated four other cases, three of them certainly pneumonia, the other probably so. All these were employees in the same shop. They had the appearance of typhoid cases when first seen and none of them had herpes.

Forms.—Liebermeister⁸⁰ recognizes as different forms (1) typical or simple pneumonia which runs a classical course and sometimes aborts by the fourth day; (2) asthenic or insidious pneumonia with several days' prodromata, longer duration, and termination by lysis, with more pronounced nervous symptoms, heart weakness, and status typhosus, complications with icterus, nephritis, endo- and peri- carditis, meningitis, gangrene, abscess, suppuration; this pneumonia is apt also to show relapses; (3) secondary pneumonia in the course of typhoid fever, small-pox, measles, erysipelas, diphtheria, malaria, tuberculosis, etc., all etiologically different from the simple form; (4) contusion pneumonia; (5) pneumonia produced by inhalation of foreign bodies, and (6) the so-called "schluck" pneumonia produced by inspiration of mucus, food, etc.

Individual differences occur in children, who show few or no subjective signs, but high fever ascribed to worms, teething, and gastric catarrh, and recognizable only by careful physical examinations. Convulsions, delirium, stupor, or coma may occur in these cases; yet the prognosis is favorable because of the vigor of the heart. Senile pneumonia shows, also, few or no subjective signs, and is, hence, often overlooked. The fever is less, but the danger is greater on account of weakness of the heart. Drinkers show early and severe nervous symptoms, with feeble hearts, which intensely aggravate the progress.

Relapses.—Wagner³²⁶ says the difficulties connected with this subject are to determine (1) whether a relapsing pneumonia is really a true croupous affection, and (2) on and after what day a relapse may take place. The author's opinion is that a relapse has occurred when a new infiltration of the old or of other lobes appears, with all the general and local symptoms of the disease, *at least three days* up to several weeks after the lungs in croupous pneumonia had become perfectly normal, the fever had disappeared, and the patient had been completely convalescent. Relapsing pneumonia, the pneumonia *à rechute* of the French, is certainly

of very rare occurrence. It develops, according to Sée, on the fifteenth or sixteenth day of the disease, and has all the symptoms of initial attack, but lasts only two or three or sometimes five or six days, being thus an abortive type, like the relapse in typhoid. In about eleven hundred cases of pneumonia during the last ten years Wagner has seen only three undoubted instances of it and several doubtful ones. He also saw one case fifteen years ago, which he reports with the others.

Certain conditions may be confounded with the relapsing pneumonia. Among these are the pneumonia with pseudo-crises, in which the fall of temperature does not last more than a day. So, also, some cases of wandering pneumonia and many instances of broncho-pneumonia, which often occurs repeatedly in a short time without any known cause.

Trauma.—T. W. Jollye⁶_{June 16} reports a case of acute pneumonia following a fall. The boy up to the time of the accident was sound in health, and there was no history of any undue exposure to the weather or of any symptoms which would lead to the belief that he was suffering from an early stage of pneumonia, which was brought to light by the accident. Foss in a paper recorded two cases in 1884 of pneumonia following an accident. In one case it was discovered the following day and in the other a few hours after the accident. In both of these it seems most probable that the pneumonia was the cause of the accidents (falls), and it shows the importance of examining the state of the viscera in any case of accident for which no sufficient cause is manifest. Sturges⁶_{Apr. 21, '78} recorded two similar cases. The first one was under his own care, and the pneumonia was brought to light by a blow on the chest. The other case was Dr. Grisolle's, and the pneumonia was detected a few hours after the man had finished some heavy lifting. To show that people may walk about and even carry on their usual business with acute pneumonia fully developed, Jollye refers to the number of people found dead or dying in the streets of London from pneumonia in an advanced stage which had never been suspected, and mentions the case of a man who fell down and fractured his skull, from which he died. On post-mortem examination there was pneumonia of the right lung.

Post-Natal Pneumonia.—B. C. Hirst⁸⁹_{p. 122} showed to the Philadelphia Obstetrical Society a specimen from a case which contrasted

well with a case of prenatal pneumonia exhibited at a former meeting. The pneumonia in this case was caused by the inspiration of blood, liquor amnii, and mucus during the labor, which was a very tedious one. The pneumonic consolidation could be found in spots about the size of a chestnut throughout both lungs. The child had a temperature of one hundred and three degrees directly after birth, and died on the third day. In a second case the disease was of post-natal origin, in that the symptoms set in at birth. The lesions described are really those of catarrhal pneumonia.

Temperature.—Whitfield Winsey¹⁰⁴_{July 28} records the case of a patient, colored, aged 13, with protracted high temperature. The highest recorded temperature, he says, with recovery, in children, is said to be one hundred and six to one hundred and seven degrees, and a temperature of one hundred and six degrees for forty-eight hours renders the prognosis exceedingly unfavorable. In the above-recorded case it lasted sixty hours.

Symptoms.—Emmett Holt¹_{May 28} read a paper on the cerebral symptoms of pneumonia in children based upon the observation of seventy-three cases of croupous pneumonia with a mortality of 5.5 per cent., and one hundred cases of catarrhal pneumonia with a mortality of 34 per cent. One hundred and twenty-three patients were under two years old. Twenty per cent. of the whole number had presented decided cerebral symptoms. In half the cases the disease was announced by convulsions. The practical question of most importance was to distinguish the cases from meningitis. This could be done only after careful and repeated examinations of the chest. This was too commonly omitted by practitioners. The great frequency of pneumonia in early life imposed upon the physician the necessity of always excluding it before accepting any other explanation of a persistent high temperature in a child. The difficulties in diagnosis were much increased by delayed appearance of positive physical signs, as in central pneumonia. In his own experience he had found that the cases with late physical signs had gradually grown smaller in number with his increased proficiency in diagnosis. Cough was usually present, but it was wanting in a sufficient number of cases during the first two or three days to make it of little value in obscure cases. Alteration of pulse-respiration ratio was more important than any other single symptom. Accelerated respi-

ration, out of proportion to the pulse and temperature, should always make us suspect disease of the lung, whatever other symptoms were present. Irregular respiration, especially of the Cheyne-Stokes type, was hardly ever seen in pneumonia. A slow irregular or slow intermitting pulse did not occur in this disease. Irregularities and intermissions in a rapid pulse were common but of no significance. It was rare for the temperature in meningitis to remain so high as it was commonly in pneumonia. The loss of the knee-jerk was the rule in meningitis. He was not aware that it had been recorded as absent in pneumonia. Localized paralyses were not present in pneumonia unless there was a complicating brain disease. The cerebral symptoms of pneumonia were usually less severe and not so continuous as those of meningitis, so that the progress of the case almost invariably cleared up the doubt in diagnosis. Between broncho-pneumonia with cerebral symptoms and pulmonary tuberculosis with a few tubercles in the brain, he agreed with Jürgensen that the diagnosis might be impossible. He drew the following conclusions: 1. Cerebral symptoms in the pneumonia of children were very common. 2. Convulsions belonged, almost without exception, to infancy, being rarely met with after the age of two years. Occurring at the onset, they belonged essentially to lobar pneumonia; they did not indicate a bad prognosis, or even, in most cases, a severe attack. When late convulsions came on, death within twenty-four hours might confidently be predicted. 3. Delirium came oftenest between the ages of five and eight, usually in conjunction with extensive disease and high temperature. These cases, although severe, with but few exceptions ended in recovery. 4. There was no such intimate association between cerebral symptoms and apex disease as had been frequently stated. Such symptoms occurred in only about one-fifth of the apex cases. 5. Nervous symptoms occurred much more frequently when the disease was extensive and the temperature very high. He closed by emphasizing two points in treatment—first, that in the hyperpyrexia of pneumonia the cold pack was a safe and most efficient means of reducing the temperature; second, the use of antipyrine to allay restlessness, quiet delirium and cough, and promote sleep. Doses of two or three grains were sufficient in an infant from six to nine months. It might be repeated every six or eight hours.

Diagnosis.—Illustrative cases of the value of the pneumococcus in this direction are reported by Russian physicians. Thus Ignatieff, ²¹_{v. 22, p. 197} of Moscow, details four cases of tuberculosis complicated by pneumonia as recognized by the discovery of both forms of bacteria, and maintains that the presence of the diplococcus renders much more grave the prognosis of tuberculosis. The coincidence of the affections was verified on autopsy. Kotorsh-tchikoff, of Kazan, describes five cases in which the diagnosis of pneumonia could only be made in this way. In two cases a central lesion ran its course without physical signs up to the fifth and seventh day; in the other three the signs were those of pleurisy. Khomiakoff ⁴¹_{Apr.} declares that he was able thus to diagnosticate the disease twenty-four hours, and Lubimoff seventy-two hours, before the appearance of any physical signs. See, also, statements of Wolff, Weichselbaum, Monti, and others already cited.

Prognosis.—Fräntzel ⁴⁹⁵_{May, '91} regards pneumonia as an infectiöus disease, approximating erysipelas in its course. The frequency of the pulse in pneumonia is of the first importance. The rapidity of breathing is of much less moment. If the pulse-rate exceeds 120, the prognosis is grave. Delirium is a bad sign. The heart should be carefully examined each day. The prognosis is made worse by severe diarrhœa, purulent exudations, or the occurrence of icterus; it is influenced also by age and habits of life. More cases of pneumonia die now in Berlin than formerly, the reason being that the consumption of alcohol, especially of beer, has increased in a frightful manner. The abuse of spirituous liquors is responsible, also, for making the prognosis graver.

Mortality.—This subject has been attracting a great deal of attention during the past year. Some of those who have discussed it have been disposed to take the ground that the rate of mortality has increased within the last fifty years, and that such increase is due in no small degree to unsuitable treatment. ⁹⁹_{Nov. 15}

Hartshorne read a paper before the College of Physicians, of Philadelphia, on the "Past and Present Mortality and Treatment of Pneumonia," ⁹_{Apr. 7} in which the average mortality of pneumonia during the second quarter of this century is safely and fairly estimated, from various statistical sources, at 8.33 per cent., a mortality which is favorably compared with that of 16 to 20 per cent., as given in the terms of the Collective Investigation Committee of

the British Medical Association. In the Pennsylvania Hospital, in the three years 1845-47, the mortality from pneumonia was 6.25 per cent.; in the years 1865-67, 18.5 per cent.; in 1884-86, 31 per cent. According to Loomis,¹⁰²² the average ratio of deaths from pneumonia to those from all diseases together in New York was 15.2 per cent. greater between 1859 and 1877 than between 1840 and 1858. From these figures the writer deduces a demonstration of the large increase in the proportion of deaths from pneumonia over what it was thirty, forty, and fifty years ago. Moreover, from a comparison of these and other figures with the modes of treatment prevalent at various periods, the conclusion is drawn that there is reason for the judgment that the now current "working theory" of the treatment of pneumonia and allied affections, by early and continued stimulation and narcotism, is not supported by the facts concerning the results of that treatment, as compared with those of the *moderate, early, sedative, eliminative* practice of forty or fifty years ago.

According to Gouverneur M. Smith,⁵⁹_{Oct. 30} New York experience corroborates the statistics of Philadelphia. From a table furnished him showing the number of cases, the number of deaths, and death-rate from pneumonia occurring in the New York Hospital for a period extending from the years 1810 to 1887, divided into decades, it appears that the lowest mortality occurred between the years 1820 and 1830. The mortality has been rising, and during the last decade it reached its acme—considerably over double the earlier percentage. Dr. Smith thinks that, from such sources of inference as are at hand and from observation, it may be regarded as an accepted fact that the death-rate from pneumonia is much greater at present than it has been hitherto. His conclusion is that science and pneumonia have ever been at loggerheads, and that the latter is vanquishing its more pretentious foe.

On the other hand, the ground is taken⁹_{Dec. 11} that, although a study of the history of the treatment of pneumonia makes one almost despair of the future of therapeutics—so impossible does it seem to arrive at reliable conclusions regarding the use of medicines—yet our feelings of despair vanish when we compare the figures of to-day, bad as they appear, with those of the *first* quarter of the century; for we see that there has been in the treatment of pneumonia, as in that of fevers, a steady, progressive enlightenment.

This comparison, it will be noticed, is made with the first quarter of the century, and that of Dr. Hartshorne with the second and third quarters.

The subcommittee of the Collective Investigation Committee, commenting on the figures presented in regard to mortality in pneumonia, reminds us that it is evident from the statistics of consecutive years that the death-rate of pneumonia varies very widely from year to year. In 1875 the mortality from pneumonia at the London Hospital was 24 per cent.; in the year following it was 39 per cent. Of forty cases admitted to Middlesex Hospital in 1871, fourteen died; while of the same number admitted in 1873, only five died. At Westminster Hospital the death-rate varies from 10.6 per cent. to nearly 23 per cent. The aggregate mortality, however, the subcommittee thinks, fairly represents the present death-rate of acute pneumonia in England, and suggests a comparison of these figures with the old statistics of Lewis, Chomel, and Andral, showing a mortality varying from 30 to 55 per cent., with Bouilland's "jugulant" practice with an asserted death-rate of about 12 per cent., and with the late Dr. Hughes Bennett's more recent series of one hundred and twenty-nine cases with only four deaths.

The last contribution to this side of the question is from Osler,¹¹²_{Nov.} who does not find that the statistics of the large hospitals show any decided increase in the rate of mortality from pneumonia. He has taken the figures of three representative institutions—the Montreal General Hospital in the North, the Pennsylvania Hospital in our Middle States, and the New Orleans Charité in the South. At Montreal the statistics are available since 1853, and give the following results: In the decade of 1853–63, a mortality of 16.2 per cent.; in 1863–73, 16.1 per cent.; decade ending 1883, 23.7 per cent.; and in the years 1883–87, 20.3 per cent.; a total of one thousand and twelve cases with two hundred and six deaths, equal to 20.4 per cent.

The total number of cases admitted to this hospital, which has not been materially enlarged, has increased with each decade. In 1873–83 as many were admitted as in the previous twenty years. Taking the statistics of four periods, according to the method of Hartshorne, the figures do not indicate a regularly progressive increase in the mortality. In 1853–55 there was a death-

rate of 24.3 per cent.; 1863-65, 12 per cent.; 1873-75, 29.1 per cent.; 1883-85, 16.1 per cent. The statistics of the Charité Hospital, of New Orleans, dates from 1830. In five decades from 1830 to 1880 the death-rates have been respectively as follow: 46.6 per cent., 35.3 per cent., 32.2 per cent., 43.9 per cent., and 40.2 per cent. In a total of three thousand nine hundred and sixty-nine cases there were one thousand five hundred and nine deaths, a percentage of 38.01. As illustrative of the beautiful elasticity of figures and as showing that the mortality at the Pennsylvania Hospital has been, if anything, reduced, Osler parallels the selected periods of three years in the fourth, sixth, and eighth decades of the hospital records previously quoted from Hartshorne's paper by four other periods of three years in successive decades as follows: 1848-50, percentage of mortality, 37.9; 1858-60, 21.2 per cent.; 1868-70, 22.8 per cent.; 1878-80, 32.7 per cent. In a total of seven hundred and four cases since 1845 the mortality has been 29.1 per cent. Precisely the same death-rate is given for the past thirteen years for the Boston City Hospital, where a very large number of pneumonias enter, and where, out of a total of one thousand four hundred and forty-three cases, there were four hundred and twenty-one deaths. Other statistics adduced coincide in a general way with those we have quoted.

For ten years past Osler says he has practiced free bleeding to the amount of from twenty to twenty-five ounces in adults in cases where he thought it might be indicated, and yet he has to confess to disappointment in his results. He has seen but one case recover after bleeding out of twelve or fifteen, and his cases of bleeding in the late stages have been uniformly fatal. I very much doubt whether the mortality rate from pneumonia can be fairly shown to have progressively increased during the last fifty, forty, or thirty years, and I am decidedly of the opinion that the treatment of to-day is more rational and better calculated to aid the natural tendency to recovery in uncomplicated cases, which, after all is said and done, is the hopeful feature of the disease, than that of fifty years ago. In most cases of pneumonia antipyretics are calculated to do more harm than good; and common sense must govern in the use of cardiac and respiratory stimulants as well as in the application of antiphlogistics and depressants. Every one recognizes the extraordinary fatality of pneumonia

among alcoholic subjects; and where the rate of mortality from pneumonia has apparently increased, it is due, doubtless, rather to the growth of the dissipated and squalid classes in the populations of our large cities than to any modifications of treatment. Allowance must also be made for the improved methods of diagnosis. More cases of pneumonia are recognized in our day, more especially in separation from tuberculosis, which a number of "pneumonias" now turn out to be.

Treatment.—Maragliano,^{6 Nov. 10} admitting that pneumonia is an infecting malady, showed to the Italian Medical Association that the hypokineses or the akineses of the heart is to be ascribed, not only to the grave mechanico-hydraulic disturbances of the circulation, but also to the presence in the blood of a toxic principle developed from pathogenic organisms. He is opposed to "nihilisms" and to parenchymatous injections. He had something to say for the opportuneness of general venesection, while to lower the fever he counseled the gradually cooled bath and combated the objections made to the refrigerant treatment. To obviate the cardiac failure, he warned the practitioner against ipecac in the active stage of the disease, and recommended alcohol in measured proportions, digitalis, and strophanthus. The cardiac akineses he would combat in its effects. Sometimes blood-letting is especially useful for hydraulic reasons. Dr. Lucatello, having studied bacterioscopically the blood of pneumonic patients, observed that the serum in feverish cases is sterile, which he attributed to the presence of toxic matter due to pathogenic micro-organisms and poured into the torrent of circulation by the pneumonic heat. Professor Cantani recalled the fact that not every pneumonia presents itself under the same characters, but varies according to the condition of the patient and the nature of the pathogenic bacterium. Blood-letting, useful if called for by hydraulic conditions of the heart, should be fully practiced, if only it could be practiced from the pulmonary veins. For the cure of pneumonia running a normal course, it is enough that the patient be put under favorable hygienic conditions. Dr. Hippha Felice held that in Sardinia pneumonic cases were successfully treated with one or more blood-lettings and with the application of leeches. Bianchi maintained that in many such cases he had met with an enormous dilatation of the right auricle, and added that in children's cases he

had found great advantage in blood-letting. Pansini admitted the utility of blood-letting and would not confine it to pneumonia, while Colonna contended that the practice was always injurious, and urged that in the treatment of pneumonia no medicine whatever was needed. Baccelli recommended the inhalation of oxygen and gave evidence of its utility in the period of carbonic narcosis.

Liebermeister ⁶⁹ _{Nov. 24-29; Apr. 21} follows the expectant and symptomatic plan, which is based upon a clear conception of the course and dangers of the disease. The majority of deaths occur from paralysis of the heart in consequence of the increased labor, or from heart weakness, the result of fever. We have here our indication for treatment: for the first, stimulation; for the second, antipyresis. Abstraction of heat by external cold is preferred to drugs, which are used only when hydro-therapy fails. Liebermeister does not regard the fever as an unmixed evil, but inclines to the view that it is reactive and conservative, an expression of the struggle which is taking place with the microbes of the disease. He employs the bath in preference to other methods, and orders one whenever the temperature reaches 104° F. (40° C.). The water may be at 68° F. (20° C.), in which case the patient remains only ten minutes, or the time may be prolonged if the water be lukewarm and gradually cooled. The baths are given preferably after seven o'clock in the evening, as in this way the morning remission of fever is increased. During the day, if necessary, cold spongings are employed. Experience has proved to be groundless the fear of chilling and increasing the inflammation; on the contrary, the patients breathe more deeply, expectoration is freer, and the entire system is refreshed and stimulated. No recent statistics are offered, but he quotes his Basel records of one hundred and fifty cases treated in this way, with a mortality of only 10.5 per cent. against an average of 25 per cent. under the old methods during a period of thirty years. Antipyretic drugs, quinine, antipyrin, and antifebrin are seldom used, and then only to maintain the action of the bath. Digitalis, which for so many years was looked upon as a substitute for blood-letting, has its uses in reducing fever and supporting the heart. Alcohol is regarded as the most important remedy against the progressive heart weakness. Blood-letting is advised in œdema of the unaffected lung. Cupping is not thought to have any influence in the inflammatory process, but it relieves the

pain, a result as well obtained by hypodermic injection of morphia or by the application of cold.

The beneficial results of tartar emetic in the treatment of seventy or eighty patients have been so striking that Brückner⁶⁹ is quite enthusiastic over them, having in a great majority of his cases seen great improvement occur.

Petresco²² read a paper in which he sought to prove that pneumonia can be checked at the outset by digitalis given in large doses. Accordingly, the dose of from one drachm to two drachms (4 to 8 grammes) of the powdered leaves in infusion is the proper dose for the pneumonia of adults. In children he gives from twenty to thirty grains (1.3 to 2 grammes).

Fräntzel⁹⁰ recommends absolute rest in bed, liquid nourishment (milk-soups). For thirst, lemonade made from lemons. Internally, vegetable or mineral acids. Wine not before the eighth day if the patient is not accustomed to spirituous liquors. In delirium potatorum, wine, bitters in moderate doses, then chloral (8:120, two tablespoonfuls at once, subsequently one tablespoonful hourly, till the patient is quiet or gets to sleep). In the delirium of fever, morphia, given subcutaneously, is well borne; in inanition delirium it acts more promptly. Dangers assail the pneumonia patient mostly on the fifth day. The breathing becomes difficult, the expectoration is arrested, stertor may begin, the pulse becomes more frequent and smaller. Under these circumstances are indicated camphor and benzoic acid, 0.1–0.5 grammes (grains $1\frac{1}{2}$ to $7\frac{1}{2}$), valerian, musk, and large doses of wine; champagne is not advisable on account of the amount of carbonic acid eliminated from it. Opium should be much more used than heretofore in pneumonia (?). Other expectorants should be used only exceptionally; liquor ammonii mur., never. Nourishment must be restricted to liquids, because the patients reject solids.

Angel Money⁶ praises the use of the ice-bag in broncho-pneumonia, having now employed it in many severe cases. To be successful the treatment must be carried out thoroughly and systematically, the rectal temperature being the best guide to the application of cold, and the cause of broncho-pneumonia having no influence. When a rapid effect is desired two ice-bags may be applied to the head and one over the chief seat of consolidations

in the lungs. This plan of treatment maintains the strength of the heart, the respiratory centres, and the nervous and muscular systems, and convalescence is rendered more rapid. The ice acts not merely by removing heat but as a sedative. In this way it produces sleep, soothes the whole system of motor and sensory centres, and directly and indirectly quiets and steadies the heart and circulation. The beneficial effect on the heat-centre is well shown by the temperature chart; and a piece of ice applied to one part, especially the head, will produce cooling of the whole surface. Diarrhœa is not increased by the cold method, vomiting is often prevented, albuminuria is not rendered worse by it, and no cases of hæmaturia have been seen. The employment of cold does not obviate the necessity of stimulants but renders them less necessary.

BRONCHITIS.

Etiology.—There is a growing tendency to look upon bronchitis as a disease influenced to a certain extent if not induced entirely by the action of micro-organisms upon the mucous membrane of the bronchi. According to Potain, ¹⁷⁷_{Nov. 19} this hypothesis is admissible if one reflects that bronchial affections so frequently exhibit epidemic characteristics. The vitality of the individual becoming lowered by living amid non-hygienic surroundings, such as overheated and poorly ventilated apartments, he readily succumbs to the combination of micro-organisms and sudden change of temperature. Thomas, ²⁰⁷_{Dec.} of Chicago, narrates the history of a case of so-called asthmatic bronchitis, caused by the inhalation of considerable quantities of lime-dust. Previous to the time of the first attack the patient's general health had been good and her chest free from any signs of disease. In these attacks of bronchitis she had severe cough and some expectoration, which condition lasted only a few days, but was renewed whenever she was exposed to the same cause.

Symptomatology.—Thos. R. Frazer ⁵_{Feb.} has contributed observations upon the causation of dyspnoea in bronchitis, where dry râles having the same character as those occurring in asthma are found. He made sixty-one observations on twenty-five patients suffering from bronchitis, and in forty-eight of these the administration of the nitrites succeeded in removing "every vestige of rhoncus or sibilus for varying periods of time." In ten the sounds were much

diminished in number, and in three the result was slight or entirely negative. He concludes from the effects obtained by the administration of these drugs that the cause of the dry sounds cannot be the swollen and congested condition of the mucous membrane, as has been taught; for, that being the case, the nitrites would increase rather than lessen these sounds. Nor could the adhesive mucus be the cause, otherwise the nitrites, having no special effect on mucus, would not succeed in quieting these râles. It is concluded, then, that these dry râles occur because of the spasmodic contraction of the muscles surrounding the bronchial tubes, and that the dyspnœa is the result of the consequent impediment to respiration.

B. W. Richardson²² has called attention to an important symptom, which he calls "hydrops bronchialis," coming on late in the course of dangerous diseases and of toxic accidents. The phenomena occasioned by this condition are described by people generally by the term "death-rattle," which in the large majority of cases is the prelude to death. This condition, the writer states, is caused by an accumulation of water in the bronchial tubes or by a hinderance to the evaporation of the watery secretion.

The accumulation of watery vapor in the apartment in which the patient lies and the reduction of the body-heat are the obstacles to the evaporation of moisture from the lungs. As signs of this condition, there are marked obstruction to the breathing, coldness of the body, loud and watery bronchial râles, until, finally, the patient is drowned in his own secretions, death taking place from asphyxia. Richardson thinks that with timely measures of treatment this accumulation of fluid can be prevented in many cases of asthenic bronchitis, pneumonia, etc. The methods of treatment employed consist in first banishing the bronchitis kettle or anything that would contribute to the dampness of the patient's room. The air of the apartment may be dried by means of an ordinary fire, and in addition, if necessary, this process may be expedited by placing in the room a vessel containing a few ounces of strong sulphuric acid. Hot bottles and dry, warm bedding are applied to the patient, and in this way evaporation is encouraged. The hygrometer may be used to test the humidity of the atmosphere, which should be indicated by thirty degrees on the hygrometric scale, with a temperature of 70° F. (21° C.)

or 80° F. (26.6° C.). With these external measures, combined with the use of some astringent remedy, such as dilute sulphuric acid, it is thought that many cases may be saved.

Treatment.—In the treatment of chronic bronchitis, especially of the aged, Wyss,⁸⁰_{May 15} of Geneva, has used naphthaline with advantage, and finds that it acts as an energetic expectorant and stimulant. It is best prescribed in pastilles, each containing one and one-half to eight grains (0.1 gramme to 0.5 gramme), one to be taken three times daily. It should be carefully used, lest it show its irritant effects on the kidney and produce disturbances of nutrition in the eye. Terpene, in doses of .20 to one gramme (3 to 15 grains), three or more times daily, is recommended by Dr. Lépine,⁸⁰_{May 15} of Lyons. Bufalini and Martini,¹⁷_{July 12} found that it may be given with impunity to the amount of .50 gramme to five grammes per day (7½ to 77 grains) in cases of acute or chronic bronchitis, with no trouble occurring on the part of the digestive or urinary tracts or the nervous system, and that the drug has no effect in decreasing the amount of the excretion, but renders it more fluid, thus facilitating expectoration. Terpinol has been used by the same authors in various cases of bronchial troubles in doses varying from one to six grammes (15 to 72 grains), with results almost similar to those obtained from the use of terpene. According to Wyss,²⁵_{Mar. 30} menthol, used by inhalation, has proven an excellent expectorant, facilitating and diminishing the expectoration and allaying the violent attacks of cough, which so exhaust the patient's strength. In the treatment of the dyspnoea of bronchitis, Frazer⁵_{Feb.} found that the relief obtained from the use of the nitrites lasted some time after the abnormal sounds returned, and therefore that it is not necessary to administer the remedy more frequently than once every three or four hours. He has not observed that their administration increases the inflammation, notwithstanding their property of dilating the blood-vessels; but, on the other hand, the relief was apparent on the following day, and in a few instances a cure was obtained by their unaided influence. The nitrite of sodium and nitroglycerin are to be preferred, not because they possess therapeutic advantages over the nitrites of amyl and ethyl, but because they are more staple compounds. In the cases recorded, four minims (0.26 gramme) of a 1 per cent. solution of nitroglycerin, or one grain (0.065 gramme)

of the nitrite of sodium in a drachm (3.89 grammes) of water was given at a dose.

Sinainski⁶_{Sept. 1} gives notes of a case of capillary bronchitis in a child eighteen months old, in which all the time-honored remedies had been tried in vain, cyanosis had supervened, and the prognosis appeared to be fatal. A few inhalations of oxygen produced a marked change, recovery following soon after. He thinks that in apparently hopeless cases of this kind, when the blood is not sufficiently oxygenated, we may avert the impending danger and save the patient's life by this means of treatment.

In the treatment of subacute bronchitis and the milder forms of influenza due to exposure, S. Solis-Cohen, collaborator, has obtained quite satisfactory results by the use of a pill of salol and terpine hydrate, three grains (0.194 gramme) of each, given from four to six times daily. In chronic bronchial troubles he finds that the administration of creasote, terebine, eucalyptol, and spirits of chloroform by continuous inhalation from the perforated respirator of Yeo is a valuable expedient. Paul⁶⁹ has employed with success the fluid extract of *grindelia robusta* in chronic bronchitis, both in the idiopathic form and in that complicated with asthmatic attacks, in doses of from forty-five to sixty drops daily.

H. M. Thomas²⁰²_{Nov. 26} has confidence in the efficacy of vaporized medicines, and employs in chronic bronchial troubles equal parts of tr. benzoini comp., glycerin, and alcohol with a Semple's inhaler.

Morrell⁹_{Sept. 19} derived great benefit from inhalations of warm vapor of wine of ipecacuanha, ten minutes at a time, three or four times a day.

PUTRID BRONCHITIS.

Dr. Josef Lumniczer¹¹⁸_{May 6} has given the results of his study of this malady. The etiology has heretofore been obscure, although it was known that this condition might occur in bronchiectasis, gangrene of the lungs, and even in ordinary bronchitis. It was suspected, years ago, that certain micro-organisms played some important rôle as etiological factors, and Leyden and Jaffé in their investigations found small rod forms, to which they gave the name *leptothrix pulmonalis*. They also noticed in the putrid sputum numbers of spirilla and infusoria. Lumniczer describes a short, somewhat curved, bacillus, which he found in great numbers in the plugs of pus and detritus expectorated, which give the sputum its

characteristic foul odor. This bacillus he succeeded in isolating by means of agar-agar plate preparations, so that a pure culture was obtained. The bacillus does not grow on gelatine or potatoes, but on blood-serum or agar. The growth is rapid, and, at the expiration of six or seven days, the culture medium acquires an odor exactly similar to that of the sputum of putrid bronchitis. The bacillus varies in length from 1.5–2 millimetres, and is easily stained with the aniline dyes. It flourishes at a temperature of 36–38°C. (96.8–100.4° F.), while the ordinary temperature of the room, or one elevated to 42° C. (107.6° F.), is not favorable to its growth.

He states that this variety of bacillus was not found when the sputum had lost its peculiar foul odor as a result of disinfectant inhalations, but after the suspension of such treatment it was again discovered as soon as the expectoration became foul. To determine what pathogenic effect this micro-organism had upon animals, Lumniczer performed several inoculation experiments, the first of which was upon a healthy rabbit, into whose trachea he injected, on four different days, an emulsion prepared from one of his pure cultures. After the animal was killed the examination showed that, notwithstanding the repeated injections, no great change occurred in the lung-tissue; and it could be inferred that the evidences of the slight bronchitis as well as the peri-bronchitis that were present were caused by the mechanical irritation of the injected fluid, rather than by any specific action of the bacilli. In the second experiment the fluid, containing a pure culture, was injected into the pleural cavity of a healthy rabbit; soon after, the respiration became accelerated and the breath-sounds roughened. Eight days subsequently another inoculation was practiced and was followed by increased dyspnoea. The animal died twelve days after the first injection, and the post-mortem examination showed evidences of a severe pleuritis of the side into which the preparation had been injected, while the adjacent lobe of the lung was anæmic and emphysematous in places, and in others gangrenous, containing small cavities from which could be expressed a dirty, greenish secretion.

The mucous membrane of the bronchioles was much thickened and the lumen was filled with a mass of detritus consisting of pus, epithelial, and blood cells. In the exudate on the pleura,

as well as in the bronchi and lung-tissue, the injected bacilli were found in great numbers; they had also invaded the lymphatics of the part, and were to be seen in the small thrombi that filled the blood-vessels.

The third experiment was performed upon an animal in which a bronchitis had been induced by inhalations of ammonia vapor. A pure culture of the germ was then injected into the trachea of this animal and the dose repeated in eight days. Death followed in fifteen days, and the autopsy gave results very similar to those in the previous experiment. The bacilli were found in abundance, not only in the plugs of detritus in the bronchi, but also in the infiltrated lung-tissue. Pure cultures were subsequently made from these specimens.

From these experiments, Lumniczner concludes that the pathogenic influence of this germ is proven; and the effects of its presence in the lungs are shown, whether it gains entrance through the pleura or pleural cavity, or through a bronchial mucous membrane already suffering from inflammation. The alveoli and the interstitial tissue of the lungs become involved, while, if the lymphatics of the part are invaded, the inflammation may extend to tissue remote from the original seat of the disease, causing gangrene of such tissue.

In a case described by Professor Levashoff,⁶ the etiological factor seemed to be some irritating and septic material inhaled from furs, felt mats, etc., in which the patient was accustomed to wrap himself when traveling in Siberia.

Symptomatology.—This disease begins as an ordinary bronchitis, which later assumes the purulent form; or it may be engrafted upon a chronic pneumonia, a bronchiectasis, or even a suppurative pleuritis that has perforated into the lung. The early symptoms are those of simple bronchitis. The pulse is rapid and there is continuous fever, but the temperature record is usually irregular. The change to purulent inflammation may be marked by a chill or a succession of chills. Respiration is accelerated, and the severe cough causes the abundant expectoration of an alkaline, semi-liquid, putrid sputum, which sometimes amounts to seven or eight hundred cubic centimetres per day. This sputum possesses an odor said to be quite characteristic of the disease, and resembling somewhat that of acacia blossoms. The disease may termi-

nate favorably, or it may cause death by the development of pneumonia, bronchiectasis, abscess, or gangrene. There seems to be no specific sign or symptom of the affection, unless it be the peculiar odor of the sputum, which Lumniczer claims is developed by the growth of the bacilli that cause the disease.

Treatment.—This consists largely of inhalations of medicaments possessing disinfectant properties. Lumniczer in some of his cases used carbolic acid, creasote, turpentine.

Korányi⁹_{Apr. 26} treated successfully a case of putrid bronchitis, complicated with mitral disease, with inhalation of a solution of corrosive sublimate, 1-9000 in water; five drachms (19 grammes) being inhaled morning and evening. Ferrand²⁴_{Jan. 22} recommends, in cases of gangrenous bronchitis, the inhalation of iodoform powder, and advises that thymol be exposed in the sleeping-room, so that the air may become impregnated with it. Terpinol and oil of sandal-wood have been shown by Bufalini and Martini¹⁷_{July}, to diminish the quantity and putridity of the expectoration in such cases.

FIBRINOUS BRONCHITIS.

Ninaus⁸⁴_{Apr. 7} reported a case of fibrinous bronchitis occurring in a woman of fifty-nine years, in which the characteristic fibrinous masses, branched like the bronchial tree, were expectorated in large quantities. Eppinger, in a discussion on the subject, maintained that there is a prominent difference between the appearance and formation of these fibrinous casts and those found in the bronchi as a result of a croupous exudation. In the former there seems to be a central condensed mass of exudate, which serves as a nucleus upon which are deposited successive layers of translucent fibrin. The mucous membrane is not infiltrated, as it is in a croupous exudation. Eppinger advanced the idea that on account of a chronic congestive catarrh of the bronchi the permeability of the walls of the vessels of the submucous connective tissue is increased and allows the fibrinogenous substance of the blood to escape. This transudation, moreover, is favored by the attenuated epithelial covering of the tubes, a condition that is the direct result of the catarrhal inflammation present in nearly all these cases. He suggests that because of the nature of this exudate and the history of these cases we should speak of the affection as bronchorrhœa fibrinosa to distinguish it from the original acute croupous bronchitis.

Kisch ⁸⁴_{Mar. 24} has recorded an interesting case of chronic fibrinous bronchitis occurring in a powerfully built and very fleshy man whom he had under observation for a period of eight years. The patient dated the origin of his trouble, twenty-five years back, to an illness in which he had fever and a severe cough. At the expiration of this illness there occurred the expectoration of characteristic fibrinous masses, which continued at longer or shorter intervals until the time of the report. In the last ten years these remissions had lasted only one or two days, as against periods of four or six weeks in the beginning of his trouble. The most various methods of treatment produced no amelioration of the symptoms.

PLEURISY.

Etiology.—The most interesting work reported in this department was, as might naturally be expected, biological in character. Fränkel, ⁸⁰⁹_{v. 13, p. 16} stated that it was very difficult to discover the bacillus of tuberculosis in the fluids effused into the thoracic cavity. Nevertheless, he is of the opinion that the majority of these cases are of tubercular origin. The old theory of a primary sero-fibrinous pleurisy is probably correct, although not to anything like the extent that it was formerly supposed to be and almost universally accepted. While it is seldom that micro-organisms can be found in sero-fibrinous exudations, yet they are almost constantly present in the fluid of empyema. His researches were made upon twelve cases of empyema. In three of these the pathogenesis was uncertain. There was no definite history and no apparent cause for the condition. In these cases only streptococci could be found, suggesting the possibility of a primary purulent inflammation of the pleura—this in view of the fact that these cases are usually secondary, the principal causes being tuberculosis or pneumonia. In three cases following pneumonia the micro-organisms were almost exclusively pneumococci. Here were also streptococci, probably from a secondary invasion. The presence of streptococci in such exudations is of no diagnostic importance, as they are found in cases like the three of uncertain origin, in cases due to pneumonia, and in tubercular cases with or without the tubercle bacilli. The third group consisted of four cases of tubercular empyema, two with pneumothorax and two without. It is exceedingly difficult to demonstrate the presence of the tubercle

bacillus in such exudations as Rosenbach and Garré have pointed out. If not found, the presence of tuberculosis is not excluded. Inoculation experiments with such exudations usually give positive results. When pneumothorax exists the tubercle bacilli are usually the only ones present, and the exudation shows little tendency to become putrid. This may be due to the filtration of the air in passing through the lungs, as claimed by Senator, and to the presence of carbonic acid gas. In such an atmosphere many of the micro-organisms multiply very slowly or not at all. The cavities in tubercular lungs are seldom the seat of putrid fermentations, and when one bursts into the pleura only tubercle bacilli are contained in it.

Ehrlich, however, is of the opinion that bacilli can be demonstrated in all exudations of tubercular nature except the sero-fibrinous, and it was he who, six years ago, first called attention to the fact.

The relation of pleurisy to phthisis is still a question of great interest, and Jaccoud² regards the situation of the pleurisy as of little moment. A pleurisy may as readily be the forerunner of pulmonary phthisis when it affects the lower parts of the pleural cavity as when it is situated in the apex. This is particularly true of dry pleurisies resulting in adhesions situated in the antero-lateral parts of the left side, such being more often phthisiogenic than any other.

Westbrook¹ contributes an exhaustive article on the subject, drawing the following conclusions: 1. Sero-fibrinous pleurisies, apparently simple in origin and terminating in complete recovery, so far as the local manifestations are concerned, may be followed after the lapse of a few months by the development of phthisis pulmonalis. 2. In all probability the pleurisy in these cases acts as a predisposing cause of the tuberculosis. 3. Primary sero-fibrinous pleurisy may result in fibroid phthisis, with the subsequent occurrence of tuberculosis pulmonum. 4. Fluid effusions remaining in the chest for a long time may finally so interfere with the nutrition of the lungs or of the body at large as to render it liable to tubercular infection, either local or general.

An exactly contrary opinion is expressed by Coriveaud,¹⁸⁸ based upon clinical observation and study, he having followed up his series of twenty-seven cases for twenty-five, twenty, sixteen,

eleven, ten, and eight years. He found that none of them became tubercular after attacks of sero-fibrinous pleurisy. As just such cases have been observed by many others, it upholds the theory of a primary sero-fibrinous inflammation of the pleura.

Diagnosis.—Bieganski¹³_{Aug. 15} calls attention to a new symptom as an aid to the early diagnosis of right-sided pleuritic exudation. This symptom is an increase of the heart dullness in a horizontal direction. He accounts for it by the fact that the middle lobe of the right lung becomes, to a degree, atelectatic in pleurisy, thus exposing more of the heart than is normally the case. This symptom continues until the increasing dullness due to the exudation comes in contact with the heart dullness. After the absorption of the fluid this increased heart dullness persists for a year or more. A very small exudation is quite sufficient to give rise to this symptom.

Treatment.—J. Drzewiecki,⁵⁰_{Aug. 25} of Warsaw, observing the relation existing between pleurisy and the acute diseases, and especially its similarity in many respects to rheumatism, decided to try salicylic acid in its treatment. His results were good, and his conclusions were: (1) that inflammations of the pleura, upon which no other remedies had any influence, subsided quickly under the influence of salicylate of soda; (2) that the same remedy produced a favorable turn in the course of the disease in twenty-four hours; (3) that the temperature fell; (4) that the urine increased and the effusion diminished, the patient recovering within two weeks. Salol, in large doses (32-33—7.59 to 11.7 grammes), gave even better results. The drug has not the unpleasant action of salicylate of soda, neither destroying the appetite, producing feebleness of the heart, nor collapse.

EMPHYEMA.

Desplats²²⁰_{July} classifies purulent pleurisies under five heads: (1) those resembling acute abscess; (2) those resembling cold abscess; (3) those purulent from the outset; (4) those complicating pneumothorax; (5) those due to exploratory punctures. He regards this division as of considerable practical importance and always to be regarded in deciding upon the treatment in any particular case.

Diagnosis.—When empyema complicates a case of pneumonia in an infant it often comes on very insidiously and thus escapes

observation in its early stages. Penzoldt,³⁴ therefore, proposes that this complication should always be suspected when an infant does poorly while convalescing from pneumonia, and that frequent exploratory punctures should be made in all such instances in order to exclude this possibility.

Treatment.—No new operation or plan of treatment has been proposed, except Potain's injection of sterilized air in pneumothorax, described below. Desplats and others commend the syphon drain in the treatment, except where a slough may be expected, when a free opening must be made. The danger of washing out the pleural cavity and its superfluity is the subject of a short communication from Bowditch,⁹ in which he makes the remarkable statement that he has only found it necessary to wash out the pleural cavity once in three hundred and ninety-nine operations upon two hundred and fifty patients. He regards it as a serious and dangerous proceeding. This, taken in connection with the pleuritic epilepsy of De Cérenville,¹³ is a strong argument against irrigations of the thorax. De Cérenville describes six cases that came under his personal observation of epileptic attacks, due to mechanical irritation of the pleural surfaces, as from irrigation, sounding and probing, insufflation of powder, etc. The attacks were single and multiple. He concludes that they may terminate fatally or may end in mono- and hemi-plegias.

EMPHYSEMA.

Varieties.—Virchow,⁴ accepts the classification of Laennec, who describes two kinds of emphysema—the vesicular and interlobular.

Etiology.—Laschkewitsch,¹⁴ says that exaggerated curvature of the vertebral column plays an important part in the causation of the disease. If from any reason there is excessive deviation of the thoracic portion, there will be found an augmentation of the antero-posterior diameter of the thoracic cavity and a large expansion of the lungs, with a consecutive diminution of their elasticity, dilation of their alveolæ, insufficient ventilation, dilation of the pulmonary vesicles, slackening of the circulation, augmentation of the pressure in the pulmonary arteries, increased labor and hypertrophy of the right ventricle of the heart. Other things, of course, aid the work thus begun.

Pathology.—Virchow,⁴ exhibited specimens of emphysematous lungs to the Berlin Medical Society, showing absence of pigmentation, termed by him an albinian condition of the lung, which he has sometimes found in post-mortems. He thought that without ulceration or destruction of the tissues it was impossible that the pigmentation, once deposited there, should be made to disappear. Yet one of the lobes of the lung presented had no pigment and was in marked contrast with the other lobe. It is well known that the deposit of carbon is very slight before the fifth year, and that this condition dates from that period. He could not think that there was different expiration previous to the fifth year, for this would favor the deposit of carbon. He thought there must have existed a faulty condition of the canal introducing the air through which the carbon was hindered in passing. It is well known that during the first quinquennium there occurs thickening of the mucous membrane and walls of the bronchial tubes, by which means the bronchi are reduced in calibre. Thus we understand why the carbon contained in the air which is inhaled is retained in the upper part of these bronchi and is again expectorated with catarrhal sputa; in this way it fails to reach the alveolæ. He had never found tubercles in a lung which was the seat of emphysema, and in only one instance had he found pneumothorax.

Symptomatology.—Gerhardt,⁴ describes four cases of emphysema of the mediastinum occurring in his clinic in Berlin. An important symptom of diagnosis in all of them was a fine, bubbling, crackling sound, like that of pneumonia, synchronous with the action of the heart. This crackling is evidently caused by the displacement of the air-bubbles in the mediastinum by the motion of the heart. It is heard in the whole cardiac region, but cannot be felt by the hand. There is a disappearance of the cardiac dullness, and in its stead an abnormally loud, sonorous, somewhat tympanitic percussion sound. The visible and tangible apex-beat disappears and the intercostal sunken spaces fill up. The diagnosis of this condition is much easier when a skin emphysema is also present. It is usually not a dangerous complication.

Treatment.—Rolleston¹⁵ reports a case in which advanced emphysema, slight bronchitis, and dilatation of the right side of the heart existed. On two occasions when a one-drachm (3.9

grammes) dose of paraldehyde was administered, he suffered severely from dyspnœa and collapse, dying after the second dose. It appears that the drug is not without danger in cases where the respiratory centre is depressed and some degree of cyanosis is already present.

Wood ¹⁰²³_{Edin. 78} found that toxic doses produced death in frogs by paralysis of the respiratory centre. Thirty-five or forty grains (2.3 or 2.5 grammes) cause profound sleep in a rabbit with progressively diminishing respiration, and at last death from asphyxia, without convulsions.

Rossbach's chair ²⁶_{May 1} can be worked by the patient or an attendant, and affords great relief. It is of the ordinary modern

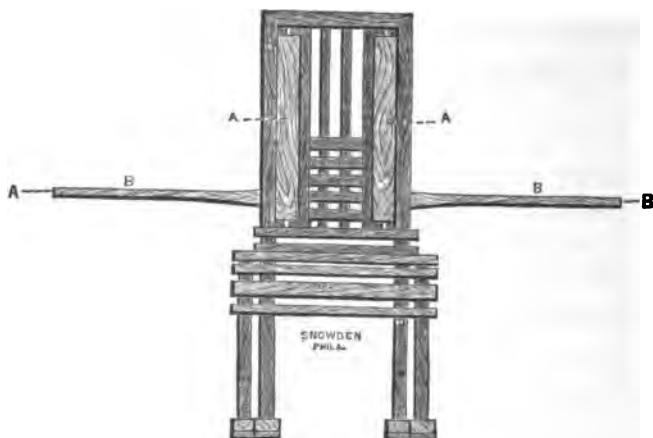


FIG. 1.—ROSSBACH CHAIR, CORSET REMOVED. (*Illustrirte Monatsschrift f. aerztliche Polytechnik.*)

variety, without arms, and with a straight back. The seat is prolonged backward about three inches and two horizontal brackets, B, are attached to the top rail. These support two wooden cylinders, A, about three inches in diameter and as long as the back of the chair. They are placed on each side just without its outer rail. These revolve on iron pins which pass through the projection of the seat and the brackets respectively. At the bottom of each is attached a lever or wooden handle of convenient length for the patient to grasp with his arms extended. When drawn forward parallel to each other the cylinders make a partial revolution. A broad band of strong webbing (F F' Fig. 2) passes across the chest of the seated patient and is attached by eyelet-holes to a row of studs,

C, on the inner face of the two rollers; therefore, on pulling the handles forward the thorax is compressed to any extent which may be thought necessary. The bandage is divided in the middle and is fastened in front as a corset. The patient rests himself in the chair, well back, the levers are drawn outward and the belt adjusted so as to press equally over the thorax, and is fastened to rollers on either side. Extending his arms, he grasps the handles, takes a deep breath, and, as expiration commences, pulls them slowly forward; the act completed, he pushes them somewhat quickly to their first position, takes another deep breath, pulls them gently together again as far as he finds necessary, and so on. Here we have artificial respiration with an automatic operator. These movements are timed and persisted in as long as the physician may direct, fifteen times per minute for ten minutes, three

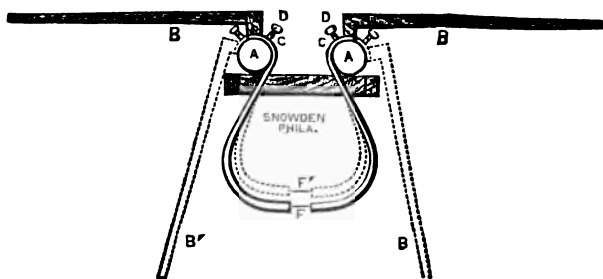


FIG. 2.—ROSSBACH CHAIR, VIEW FROM ABOVE, SHOWING CORSET-BANDAGE. (*Illustrirte Monatsschrift f. aerzliche Polytechnik.*)

times a day. This instrument equally compresses the chest. The patient can use it when once adjusted, either day or night. Any carpenter can make it at little expense. It can be used simultaneously with other forms of physiological treatment, such as Waldenberg's cabinet, or conjointly with the use of expectorants and cardiac tonics.

Berdez¹⁸⁷ believes that in some cases the respiratory act is imperfectly performed because the intra-abdominal pressure is insufficient, in other cases because the elasticity of the lungs is defective, and, consequently, the diaphragm does not relax to its full extent on account of the resistance offered. Believing in this theory, he thinks good will be accomplished by keeping up some pressure on the abdominal walls by means of an abdominal belt somewhat similar to those employed by gynæcologists. This will

sustain the intra-abdominal pressure, and during inspiration enable its contents to cause the movement of the lower ribs, while during expiration they will push up the diaphragm and compensate for the defective elasticity of the lungs. Laschkewitsch,¹⁴ says that the best remedy for this disease is gymnastics.

PNEUMOTHORAX.

In the etiology of this disease no original observations have been made. Biggs,¹ reports two cases which were due to an unusual cause, *i.e.*, the exploratory puncture of the chest for diagnostic purposes with the needle of a hypodermic syringe. In the debate following this report to the New York Medical Society other cases were reported which followed the same operation. Its treatment has, however, been enriched by the suggestion of Potain¹⁰⁰ to replace the air and fluid within the thorax by sterilized air. He reports three cases of tubercular origin entirely cured by this procedure. Others have adopted his suggestions, and have already added quite a number of successful cases to those reported by him. He does not advise its indiscriminate application to all cases, but gives the following rules: 1. In the beginning, when the pneumothorax does not give rise to any marked dyspnoea, no surgical interference is indicated. 2. When by a valvular mechanism at the seat of the perforation the air accumulates in the thorax at a dangerous tension, which can be recognized by the distention, by the displacement of the diaphragm and mediastinum, it is necessary to evacuate by puncture enough air to render the pressure within equal to that of the external atmosphere. 3. If a sero-fibrinous effusion occur, abstain from interference as long as it is not dangerous from its weight or volume. 4. When the effusion passes this limit, the fluid must be entirely withdrawn in such a manner that the intra-pleural pressure constantly equals the normal atmospheric pressure, seven millimetres of mercury. 5. If the effusion is sero-purulent and not fetid, the same rule holds good. 6. But if the seat of the purulent accumulation communicates with a bronchus, or if the effusion is purulent and fetid from the beginning, it is necessary at once to operate as for empyema, if the opposite lung will be sufficient for the respiratory needs of the individual, notwithstanding the return of the diaphragm to its original position; but if this is not the case, and

the respiration is bad and insufficient, introduce syphon drainage, which has cured many bad cases.

Renaut,⁵⁵ advocates the sterilization of the fluid in hydro-pneumothorax by the injection into the cavity with a hypodermic syringe of Van Swieten's fluid, as a modification or substitute for Potain's treatment, claiming as good results when the thoracic contents are kept perfectly aseptic, these aseptic fluids being finally absorbed.

M. Cauchois,²⁰⁸ July 1, opposes any surgical intervention in pneumothorax due to a fracture of the rib without any external injury. The air is usually aseptic, having been practically filtered in passing through the air-passages, and no deleterious results are to be apprehended from its presence in the thorax.

CYSTS AND TUMORS.

Bard and Chabannes,⁹² record their observations, followed for nearly two years, on a case of the rare affection of hydatid cyst of the lung. The true nature of the case was not manifest until a portion of the cyst-membrane was expectorated. Their studies of the subject show that this is a malady devoid of fever, and that elevated temperature occurs only on account of accidents, such as bronchitis, pleuro-pneumonia, etc., which may be excited by the presence of the growth. It seems to be almost impossible to diagnose such a growth if deep-seated, unless the fortunate expectoration of some characteristic part of the sac or the removal of some of the fluid contents reveal its nature.

If the growth be superficially situated and of considerable dimensions, the diagnosis of a cystic tumor may be made from certain physical signs, such as deficiency of expansion of the affected region; absolute dullness over a certain limited space which usually presents a rounded outline, this dullness not changing with a change of posture of the patient. If the tumor lie next the chest-wall, the peculiar purring sensation may be perceived on palpation.

J. D. Thomas,²⁶⁷ June 15, of Adelaide, Australia, where the disease is seen far more frequently than in any other part of the world, calls attention to a sign that he has observed in most cases, viz.: "An alteration of the percussion note, which becomes markedly tympanitic over a greater or less area around the tumor." Of course, this sign can only apply when such conditions as aneurismal

tumor of the thorax, a cavity in the lung, or pneumothorax have been excluded. In the case of Bard and Chabannes a complete cure followed the evacuation of the cyst. Mosler⁶⁹ records a case of ecchinococcus cyst in the lung of a man thirty-two years old, which was diagnosticated by the expectoration of small hydatids. A complete cure resulted by introducing a thermo-cautery into the cyst. Hoffman⁶⁹ reports a case upon which he operated, supposing it to be abscess with perforation into a bronchus. The pleura was found much thickened, and, after making an incision through the visceral layer, the patient, in a violent fit of coughing, forced an entire hydatid cyst, as large as an ostrich-egg, through the opening. Complete recovery ensued.

R. L. McDowell⁴⁰ describes a case of primary lympho-sarcoma of the lung in a child of three years. The physical signs indicated pleurisy of the right side. At the autopsy the right lung was found much larger than its fellow, and throughout its structure hardened sarcomatous masses, "one as large as a turkey's egg," were found; many were adherent to the pleura. Angel Money presented to the London Pathological Society² a specimen of round-celled sarcoma which had grown in the posterior mediastinum of a fifteen-months-old child. It was one-fourth the size of the thoracic cavity, extending from the fifth dorsal vertebra down to the diaphragm, and had caused extensive collapse of the lung. Symptoms indicating this condition had been observed.

ASTHMA.

Varieties.—With etiology as a basis, Harrington¹⁷⁰ recognizes four varieties, viz.: that co-existing with chronic bronchitis, that with emphysema, the uncomplicated asthma, the so-called cardiac asthma. Brügelmann⁴¹ divides asthma into (1) nasal asthma; (2) toxic asthma; (3) pharyngo-laryngeal asthma; (4) bronchial asthma; (5) neurasthenic asthma.

Epileptic asthma is a variety described by Poulet,²⁴ who thinks this form merits the name of epileptic neurosis of the gastro-pulmonary filaments of the vagus nerve. It is characterized by varying paroxysms succeeded by health. In many instances these attacks are preceded by pain in the head comparable to an epileptic aura. They come on during the day, and vomiting is a frequent symptom. It is a peculiarity of the affection that it is not

improved by the routine treatment of asthma, but is successfully combated with that of epilepsy. This guides us to the adoption of a new line of treatment of remarkable efficacy.

Thymic asthma, described by Kopp, is considered by him as nothing less than epilepsy analogous to asthma. He designates it as epileptic asthma instead of emanating from the gastro-pulmonary filaments of the vagus nerve. It has its seat of origin in the laryngeal filament of the eighth pair of nerves.

Holm⁴² describes an inspiratory dyspnoea which has not been previously brought before the profession. One peculiarity is that the paroxysms never come during the night. He considers this disease a neurosis of the phrenic nerve, and does not think it the psychical asthma of Hecker and Leyden.

Pathology has not been replete with advances during the past year in this intractable trouble.

Bosworth⁵ considers asthma dependent on (1) a general neurotic condition; (2) a diseased condition of the nasal mucous membrane; (3) some obscure conditions of the atmosphere exciting the paroxysms. From the immediate relief experienced from the use of cocaine in the nose during the exacerbation, this author is led to believe that a majority of cases of asthma are dependent on some obscure lesion in the nasal cavity. Also the same conclusion is reached from the cure of so many cases by the removal of the destructive lesions in the upper air-passages. The most intricate, delicate, and important part of the whole respiratory tract lies in the nose in that mass of blood-vessels which we call the turbinated tissues, and which serve to supply the inspired air with moisture. A diseased condition of the nasal cavity might predispose a neurotic patient to an attack of asthma under favorable atmospheric conditions. One of the noted subjects of idiosyncrasy in which the nose is implicated is Prof. Austin Flint, of New York,¹⁰⁷ who cannot sleep on a feather pillow. He is so susceptible that he is able to detect feathers placed under his pillow by persons whose design is to catch him in his idiosyncrasy.

Walsh¹⁹² considers the causes predisposing and exciting, and also believes that heredity plays an important rôle in the former. Anything which will produce an irritation of terminal ends of the respiratory nerves will produce a paroxysm.

Treatment.—Weill¹⁵² has used carbonic acid gas to relieve

dyspnœa. He had the patient inhale the pure gas from five to ten minutes at a time, using from two to five litres (four to ten pints) once or twice a day. This treatment was suggested to him by observing the experiments of Brown-Séguard on the inhibitory effect of a current of carbonic acid gas on the larynx. In using the gas there seems to be an abolition of the reflex sensibility of the pharynx and larynx. It appears to cut the paroxysms short when given during the attacks, and the palpitations which follow are much diminished. The cough stops and the respiration falls to half its previous rate, while the patient at once experiences a feeling of relief. If used between the attacks it has the effect of preventing them and diminishes their frequency. Linossier²¹¹ has confirmed the experiments of Weill. He found the dyspnœa and cough both quickly relieved by simply inhaling the gas given off from a glass containing a solution of bicarbonate of soda and tartaric acid in effervescence.

Lépine³ says the inhalation of carbonic acid gas by Weill has shown itself, even to the present time, a useful and innocent remedy in certain cases of dyspnœa, especially those of the tubercular variety. Its action on the dyspnœa and on the spasms of coughing is very great. The relief continues sometimes for several hours and even for days. Chabannes²¹¹ has made a large number of experiments with inhalations of carbonic acid gas, and invented a number of instruments used in this treatment. He considers carbonic acid inhalations superior to any other empirical treatment, as, for example, morphine, because there is no risk of intoxication and the effects are permanent. In reality the carbonic acid is absorbed in very little quantity. Its direct action is inhibitory on the larynx, and not indirect through the circulation. Chabannes³ describes a simple method of manufacturing carbonic acid gas. In a bottle closed with a rubber stopper, into which he passes a tube, is placed twelve grammes (3 3) of tartaric acid and fifteen grammes (3 4) of bicarbonate of soda, a quantity sufficient to produce four or five litres (quarts) of carbonic acid. The patient places the tube in his mouth, and the gas is very easily inhaled on account of its force of expansion. This can also be done with a common glass.

Ellis⁸⁰ considers quebracho (*aspidosperma quebracho*) a good remedy for dyspnœa. He has not observed the disagreeable effects,

as headache, partial unconsciousness, dizziness, and copious salivation, reported by some. He gives a teaspoonful of fluid extract of quebracho, repeated every hour as required. The second or third dose usually produces the desired effect. He accepts as plausible the hypothesis of Penzoldt that this remedy enables the blood to take up more acid than usual, and thus to satiate the intense demand.

Antipyrin has been quite successful in the hands of Dodge.¹ After a trial of lobelia, grindelia robusta, iodide of potassium, and pyridin he gave fifteen grains (1 gramme) every three hours during the night, and five grains (0.32 gramme) every three hours during the day. Apomorphine and antipyrin have been found of much benefit by Bories,⁴⁴ who, in despair, injected one-twelfth of a grain (0.0054 gramme) of apomorphine. Prompt emesis ensued, and the patient fell into a deep sleep, from which she did not awaken for four hours. In a subsequent attack she suffered from a severe headache, for which antipyrin was prescribed with much benefit, both to the asthma and headache.

Hyoscyamin, hypodermically, is recommended by Musser⁶² if a rapid effect is desired, $\frac{1}{16}$ — $\frac{1}{20}$ grain (0.00046–0.00054 gramme) for the spasmodic asthma of emphysema.

Brügelmann⁴¹ approves the dictum of Boecker: "In the treatment of asthma the treatment of the whole constitution of the patient is of the greatest importance." He considers iodide of potassium only of service in bronchial asthma, and of some temporary benefit in the toxic form. Arsenic, he thinks, has no effect except in neurasthenic asthma. Amylene hydrate did good service in nasal and pharyngeal and also in bronchial asthma, although the relief was transient. In his hands cannabis indica had proven a very uncertain drug. Pyridin was of temporary benefit in a few cases of bronchial asthma, but failed in all others, especially when severe. Cocaine, administered internally and by injections, at times gave surprising results in neurasthenic asthma. It frequently fails in other forms and causes alarming symptoms. Chloral is indispensable, as it gives the required rest in all varieties. He finds the induced current to act very strikingly in bronchial asthma, and sometimes in the toxic form; but in the other varieties it is inactive. The constant current he has found without result.

Poulet,²⁴_{Feb. 19} has obtained marvelous effects in his so-called epileptic asthma from bromide of potassium in six-gramme (gr. 92) doses daily, in conjunction with six milligrammes (gr. $\frac{1}{12}$) of picrotoxine and an equal amount of soda. The paroxysms were almost entirely suppressed at one stroke, but a single attack occurred at the end of ten days. Sawitzki,¹⁰⁹_{Oct.} after having tried a legion of anti-asthmatic remedies, including iodine, tincture of lobelia, nitrite of amyl, nitro-glycerin, paraldehyde, aspidospermin, pyridin, etc., concluded that the hypodermic injection of morphine in moderate doses, about $\frac{1}{2}$ grain (0.008 gramme), renders the best service. Nitro-glycerin, one-drop doses,⁶⁰_{Aug. 12} of 1 per cent. solution, promptly relieves the asthmatic seizures. It will remove the helmet-like headache in one minute. Inhalations of oxygen and cocaine by insufflation, according to this authority, are highly beneficial. Bosworth,⁵_{Sept.} emphasizes the fact that local treatment of the intra-nasal disease affords by far the most satisfactory method of controlling this disease, particularly in cases under twenty years of age. Gaul,¹⁷⁶_{Mar.} has had beneficial results from the use of weed known as Spanish needle—*bidens bipinnata*.

Lewis,¹⁸⁶_{Feb.} and many others bear testimony to the benefit of smoky atmospheres. The immunity of certain patients in London and other large cities has been long noticed.

Williams,⁵_{Aug.} highly favors the time-honored remedy of iodide of potassium, and thinks the effect is due to the action of the iodine in reducing enlarged bronchial glands. The indications for prescribing this remedy are (1) the absence of catarrh; (2) the well-marked presence of the neurotic element; (3) the detection of dullness along the right or left edge of the first portion of the sternum or in both intercapsular regions showing enlargement of the bronchial glands. He combines arsenic with the iodide of potassium with much benefit. The application of rarefied air or compressed air in bronchial asthma has been used to a considerable extent by him, and almost invariably with excellent results. The great relief comes from the reduction of the chest circumference, the reappearance of hepatic and cardiac dullness, the greater freedom of respiration, as well as many other minor improvements. Contra-indications are distinct valvular disease of the heart, extensive cardiac dilatation, fatty degeneration of the heart, or atheromatous degeneration of the arteries.

DISEASES OF THE HEART.

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ARTERIAL DISEASE AS ETIOLOGICAL FACTOR IN DISEASE OF THE HEART.

THE rapid advance which arterial disease has made during the past few years to a foremost position among the causes of cardiac affections, and the intimate relations which are known to exist between the two conditions, offer sufficient excuse for placing what has been added to our knowledge of this subject during the year at the beginning in our attempt to arrange the somewhat disjointed facts in rational order.

The importance of vascular disease is well-illustrated by *Algot Key-Aberg* ³⁷¹ ⁶¹ _{Bd. 19, No. 16; Feb. 11} through a series of papers in which he considers the relations of arterial disease as a primary cause of sudden death, holding such disease responsible for its legitimate sequelæ. The earlier part of the paper relates to "sudden death" from various stand-points, especially the medico-legal.

In the later portions, statistical considerations based upon over eight hundred autopsies lead to the conclusions (1) that 74.5 per cent. of all cases of sudden death, from a medico-legal stand-point, occurring after the age of fourteen, were due to endarteritis chronica deformans or one of its sequelæ; (2) that the usual sequelæ are paralysis of the heart, rupture of the heart, aneurism, rupture of the aorta, and intracranial hæmorrhage.

Concerning disease of the coronary arteries and subsequent cardiac changes ending in cardiac paralysis, he states that out of thirteen cases, in four there was no muscular degeneration or necrotic softening, and in only two of the thirteen did the muscle show any general fatty change. Such facts are hardly in accord with generally accepted beliefs, and we doubt if more general statistics would afford any such results.

The view that fatty degeneration is not the only, if common

change is supported by Weber,¹⁷ who claims that the principal muscular changes are atrophy and Jenker's degeneration. He also recognizes three forms of the primary arterial sclerosis: (1) perivascular sclerosis, arising by an extension of the inflammatory connective-tissue formation in adjacent tissue to the arterial coat; (2) dystrophic sclerosis, arising from a regional ischæmia, and (3) mixed sclerosis. Duplaix¹⁰⁰ concludes, also, from his studies of these lesions, their evolution, and pathological conditions, that we must recognize a form of degenerative sclerosis, very likely depending on an ischæmia (of the vasa vasorum?), which justifies the appellation of Martin, "dystrophic sclerosis."

Duplaix sums up modern notions of sclerosis in these conclusions, and the one just given regarding the dystrophic form:—

The condition is to be classed as a general disease, in which the lesions may be localized in a single organ or evenly disseminated throughout the tissues. Its generalization is fully explained by the conditions of development, the predominance of the process in a single organ, by a predisposition of that organ to develop sclerotic changes, or by the direct and specific action upon that organ of the morbigenic element. A general arterio-sclerosis throughout the entire vascular system always accompanies the more localized lesions in particular organs, and it is this general condition which gives the signal for the more marked process in the particular organ, while it unites the whole in one general morbid condition. It demonstrates, not a reciprocal dependence one upon the other, but a mutual relation to a single common cause, which, acting universally in the system, has been concentrated more particularly at one point.

Thus atrophic cirrhosis and interstitial nephritis become, not localized diseases, but manifestations of the concentration of a general morbid condition. So understood, sclerosis presents as its first manifestation a vascular lesion as the point of departure of the connective-tissue proliferation; and if in the kidney, as a consequence of special conditions, it seems to give rise to epithelial degeneration, we still find the same arterio-sclerosis playing the same part here as elsewhere.

While accepting in general the above conclusions, we cannot refrain from dissenting to the inference which might be drawn that constitutional causes were all in all as a cause of sclerosis, and

that extraneous causes only served to start up the constitutional disease or to concentrate its activity upon some one organ. We believe the reverse of the case should also be stated, that the general disease often results, in subjects who evince no inherited or congenital tendency above what every healthy organism has as one of nature's physiological protective measures, from some etiological factor that induces localized sclerosis primarily and the disseminated change secondarily.

It has been more or less clearly recognized for some time that endarteritis is at times compensatory. Johnston's observations upon muscular hypertrophy of the arteries, with the explanation offered by Conheim's theory of renal secretion, noted under this head last year, may find its counterpart in compensatory endarteritis. Thoma, of Dorpat, ²⁰_{Apr. 3} has formulated the laws of compensatory endarteritis following a detailed consideration of the question. He affirms that every slowing of the blood-current in either arteries or veins that is not met by compensatory contraction of the vessels results in a new connective-tissue formation in the intima, causing thus a narrowing of the calibre of the vessel, with the object of restoring the normal rapidity of blood flow.

In support of this statement he adduces as established facts: 1. That these changes and the slowing of the blood-current are found to be reciprocally commensurate. 2. The evidence of end corpuscles all along the arterial wall that, with each change of blood-current productive of vibratory movements as opposed to pulsatile, produce hyperæmia in the vasa vasorum. 3. That the first developments of compensative endarteritis are associated with dilatation and richer development of the vasa vasorum. 4. Koesler's demonstrations that all the markedly developed processes of this character are accompanied by mesarteritis and periarteritis.

Desplats and Augier ²²⁰_{Apr. 20} report an interesting case of arterio-sclerosis in which degeneration of the intima was very marked. Its relation to decreased elasticity of the vessels and consequent cardiac hypertrophy was well shown, also, by the heart in this case, which weighed two and a quarter pounds.

Among the unique cases of atheroma in extreme is one, ⁷_{Dec. 97} in which the atheromatous changes had caused entire obliteration of the brachiocephalic trunk and almost complete occlusion of the orifice of the left common carotid. Aside from the difference in

the pulse in the two radials, there was pulsation of such marked amplitude under the left clavicle as to cause suspicion of aneurism or dilatation of the transverse portion of the aortic arch.

The immediate and common effects of sclerosis upon the heart muscle are well recognized. Letulle and Nicolle,⁷ offer a study of the condition of the elastic tissue of the heart in cardiac sclerosis of vascular origin. They conclude: 1. That there exists a vascular sclerosis of the heart, which may be denominated "elastic," and is consecutive to chronic lesions of the nutrient vessels of the organ. 2. That this sclerosis is characterized by a hypergenesis, often extreme, of the elastic fibres of both the endo- and myo-cardium. 3. That the general directions of the fibres in the new growths correspond generally to those of the normal layers. 4. That elasticogenic sclerosis differs from other scleroses and from chronic inflammation of the heart in that it is not a lesion of inflammatory origin.

The relations of phlebo-sclerosis to arterio-sclerosis are discussed by Eustachius Sack.²⁰ His conclusions are based upon personal research and verification in over one hundred autopsies, and are as follow: Phlebo-sclerosis and arterio-sclerosis are both manifestations of a general disease, marked by impaired nutrition of the vascular walls. As a result there follows weakening of the middle coat of the vessels, dilatation with increased calibre, and consequent thickening of the inner coat. These changes are, of course, markedly influenced by the mechanical factors of the etiology. Arterio-sclerosis nodosa affects those regions where the pulse-wave is high and blood pressure is more variable, as the aorta and larger branches.

Arterio-sclerosis diffusa and phlebo-sclerosis affect especially those vessels subject to sudden decrease of blood pressure from the bodily positions that make it difficult to maintain the tonicity of the vessels. Of these regions the more susceptible are those in which the action of the voluntary muscles is less continuous, and where venous return is opposed by pressure within the abdominal cavity. Aside from this phlebo-sclerosis, there is a fibrous endophlebitis which must be recognized as a local inflammatory condition. Duroziez,¹⁷ and Crooke,² both record cases of phlebo-sclerosis and atheroma, the former claiming that such conditions are as frequent as arterio-sclerosis, and the latter suggesting the

condition, which in his case was in the pulmonary arteries and had extended to distinct atheroma, as a probably frequent cause of unexplained thromboses.

In close clinical, if not pathological, relation to sclerosis and atheroma stands congenital narrowing of the vascular canals. Fräntzel's article,⁶⁶ is the most extensive, and he bases some very important conclusions upon his observation of cases in which autopsy proved the correctness of a diagnosis of congenital narrowing of the aorta.

Such a condition affords an explanation of many otherwise obscure cases of dyspnœa and cardiac hypertrophy. It is claimed that a diagnosis may often be made by exclusion and from the evidences of obstructed circulation and diminished blood supply to the arterial branches. Müller, Fränkel, Guttmaun, and others support Fräntzel's conclusions. Delafield, Peabody, Draper, and others have noticed similar cases.

In the line of treatment J. P. Bramwell,⁶⁶ from an extensive consideration of the subject of hyperarterial tension, concludes that venesection has been too much neglected in cases of both acute and chronic increase of arterial tension. In Bright's disease and uræmia, in particular, he urges its use in appropriate cases, while advising nitro-glycerine for the earliest stages when a sharp cardiac second sound is the only indication of the approaching disease.

ANEURISM.

The clinical relations which arterio-sclerosis and high tension bear to aneurism has been long recognized, but there seems to be a tendency to deny the accepted belief that endarteritis and atheroma are always the primary changes. We have already instanced several authorities as recognizing a dystrophic sclerosis and an arterial degeneration. In the same line, Biggs,⁵⁹ claims, in reporting cases of sudden death from aneurism, to have found degeneration of the muscular coat and the elastic fibres rather than a true endarteritis. It seems questionable, however, as to how far pathological conditions at the time of the rupture of an aneurism can be taken as proof of the primary changes.

Malmsten,⁴ makes the statement that all the available records in Sweden of aneurism show syphilis to have been the cause in 80 per cent. and senile degenerative changes in nearly 20 per cent.,

and he affirms that traumatism and mycotic affections rarely cause aneurism. Jaccoud,¹⁴_{Nov. 21} in studying the agency of syphilis as a cause of aneurism, states that the primary change is endarteritis and that the iodide treatment is available only in what he calls the pre-aneurismal period, a statement with which we can hardly agree.

Litten,⁴_{Nov. 14} notes a new symptom of aneurism from two cases in which it was observed, viz.: that inequality in the radial pulses may become manifest if the arms be raised vertically, even when it is not present while the arms hang at the sides.

Several cases are reported showing to what extent an aneurism may advance without serious inconvenience to the patient. In the most marked of these, Bramwell,²_{Apr. 28} the aneurism had projected through the chest-wall for over seven years, while the patient continued his occupation, and finally he came to a physician for an accident to the eye the day before the aneurism ruptured. His heart measured ten and a half inches vertically and seven and a half transversely.

Treatment.—Little new has been added to methods of treatment. Iodide still holds the first place. Germain Sée,¹⁰_{Aug. 14} strongly reaffirms the efficacy of this treatment, and holds that it can have only a beneficial effect on tubercular processes, which he records as often consecutive to and dependent upon the aneurismal condition. Having noticed the frequency of phthisis in connection with aneurism, he argues that the deranged circulation, pulmonary congestion, and consequent suboxidization of the blood furnish typical conditions for the growth of micro-organisms, and then, slipping, according to our mind, from the real into the ideal, he says that, as endocarditis and endarteritis are so nearly identical, if one is associated with bacilli the other may well be supposed to be also. This appears to us one of those delusive arguments so frequently used by the radical defenders of the bacillar theory, based upon an unexpressed assumption which is only half true, but which, for the purpose of the argument, is taken as wholly so. In this case, for example, it has never been claimed, certainly never proven, that any form of endocarditis other than ulceration is directly due to a bacillus. Certainly fibrous or chronic endocarditis can not at present be ascribed to any such cause. Yet his argument presupposes this. He formulates the good effects of the iodide thus: (1) on the dyspnœa dependent upon

abnormal secretions, by liquefying the products of catarrh; (2) on intrapulmonary troubles, by inducing hyperæmia and suppressing stasis; (3) on the volume of the tumor, by retracting the walls and surrounding tissues, and thus secondarily relieving the pressure. He combines with the iodide sparteine as a vascular tonic, and antipyrine as an analgesic. Antipyrine, he states, makes the cardiac action more regular, and gives such results that he is inclined to attribute them to some effect upon the adventitia of the arteries. He affirms that iodides with antipyrine afford the only means of curing aneurisms. On the other hand, Spillmann,¹⁷ claims, from over one hundred cases, that electrolysis is the proper method of treatment of so-called medical aneurisms. He affirms that cures result which hold good for years, and that the relief to the patients is inconceivable. Richter⁷⁷ also reports cases of cure by electrolysis, one man doing severe labor for four and a half years. He has not had a failure where the positive pole alone was introduced within the aneurismal sac.

Lépine,¹⁶⁴ in a letter addressed to Verneuil, deprecates too hasty conclusions regarding Moore's treatment. He claims that the coil affords support to the clot, which is not offered in electrolysis, and therefore gives less danger of embolism.

A rare case of absolute spontaneous cure of an aneurism of the transverse arch without obliteration of the artery is reported,²²⁸ and Wells¹ records a successful ligature of the right common carotid and subclavian for aneurism of the brachiocephalic.

Segay¹⁸⁸ advocates the use of the sphygmograph as a means of verifying results in the treatment of aneurism by any method, and records the valuable indications he has obtained tending to modify treatment during the process of solidification of aneurisms. (See section F, volume iii).

ULCERATIVE ENDOCARDITIS.

Etiology.—The general tendency seems to be to recognize ulcerative endocarditis as always of infectious origin. Vinay,²¹¹ in studying a chronic case of endocarditis, makes the claim that the non-ulcerative forms may also depend upon a specific element. Cultures in his case made from the patient's blood gave negative results, while those made from the non-ulcerating vegetations on the valves were successful and inoculations with the products

for multiple abscesses in kidney and bones. To our minds the results hardly justify the conclusion that staphylococcus pyogenes is to be regarded as the essential cause. It seems more reasonable to suppose that several different germs may incite suppurative or ulcerative changes in tissues already weakened by previous inflammatory changes.

Vinay's case was somewhat remarkable for its duration, two months, though Letulle mentions a case,⁷³₁₉₀₀ which lasted four months, and another lasting five months is also reported.²₁₉₀₀

Vinay's general conclusions do not differ from those reported in last year's ANNUAL. He lays special stress, however, upon the omnipresence of staphylococcus pyogenes aureus, and considers it the most important of the elements inducing suppuration. In this connection he places the general condition of the patient, both his inherited vitality and all the secondarily acquired conditions as of the utmost importance in determining the successful invasion of the system by pathogenic elements.

From inoculations of artificial emboli of elder-pith, made infectious by mixture with cultures of the various germs, he concludes that prolonged contact without previous injury may result in septic inflammation.

It is also claimed that the streptococci have a tendency to induce abundant valvular vegetations and few metastatic abscesses, while just the contrary holds good of the staphylococci. After all has been said, however, a primary rheumatic or atheromatous lesion of the valves is accepted as the most important predisposing cause of the ulcerative infection.

Haushalter⁹²_{Apr. 10} offers a study of endocarditis complicating pneumonia. He states that the changes wrought in the cardiac valves are no less irremediable and grave, though the process that produces them is a very slow one. Frequently the disease occurs without any symptoms to betray this process. If the patient gets well, some years may elapse before the cardiac affection is revealed. If he dies, the autopsy shows how an acute endocarditis had been established, with vegetations or erosions, or with neither. But in the case where the valves appear sound, can one say that the patient was free from an infection that would have developed had he survived? The author believes that he has established the impossibility of coming to any such conclusion.

The patient in this case died of pneumonia on the eleventh day. Two days before his death, pulmonary abscess was suspected and pus obtained that contained micrococci in little chains. These same micrococci and the characteristic pneumococci were also found in the sputum. After death, pneumococci were found in all parts of the lung, single or encapsulated, in twos and also in chains of micrococci, identical with those found in any acute abscess. The cardiac muscle contained some pneumococci. The endocardium showed nothing, with the exception of a single sprig of fibrin scarcely perceptible. In it no pneumococci could be detected, but, after hardening, masses of pneumococci were revealed under the microscope. They were well in the centre of the thickness of the valve. In this case none of those superficial lesions existed which are supposed to be necessary to the presence of micro-organisms. Haushalter believes that they did not penetrate by the central cardiac cavity, but entered the small vessels and capillaries of the valve and formed there bacterial embolisms. The fact that the valves are so slightly vascular is a difficulty that is avoided by supposing that the microbes migrated from the capillaries containing them into the connective tissue where they were found. He supposes that the microbes would have reached the surface, had the patient lived, and produced the usual lesions of endocarditis. But if this could not be, and if we imagine them imprisoned in the substance of the connective tissue, they can be supposed to act as foreign bodies and irritants that set up a process ending in sclerosis and neoplasms.

The author supposes that the fibrous transformations induced by the microbes might modify the elasticity of the valves and eventuate in distinct lesions. His conclusions are as follow: 1. Germs may be present in valves presenting a normal appearance. 2. Such micro-organisms may represent the etiology of an entire class of cases of chronic endocarditis, and their origin be in some former infectious disease from which the patient has entirely recovered. The late development of endocarditis after typhoid fever would seem to be one of this class of cases. 3. The period during which such germs remain latent, so far as appreciable symptoms of their action go, may be almost definitely prolonged.

Very many authorities support this statement, that the infectious element of very many diseases may induce ulcerative endo-

carditis. Humphry⁶ reports an interesting case, and notes the frequency with which pneumonia is the precedent condition.

Netter⁴¹⁰₁₀₀₈ reports a list of eighty-two cases, and Klebs, Osler, Gulliver, Heschl, and others are also precise upon this point.

Weichselbaum⁵⁴_{Feb. 1} gives his results in sixteen cases in connection with experiments on animals. The results are simply confirmatory of the already accepted belief that there are several forms of bacteria which, with or without previous injury of the endocardium, may set up in that tissue suppurative and necrotic changes.

An important case of primary septic tricuspid endocarditis without lesion of the left heart is given by Malvoz.⁹²_{May 10} He remarks that hitherto there have been but isolated cases of acute inflammations in the right heart, though during foetal life there is a predisposition to affections of the right heart. The Bulletins of the Anatomical Society, of Paris, report only ten cases in sixty years (1826-1886). In most of the cases hitherto noted the disease affected right and left heart simultaneously, and in none could the determining cause be distinctly associated with the right heart.

In the significant case reported the axillary vein was wounded and ligated during an operation for removal of mammary cancer. This was followed by thrombosis and pus in the wound. The autopsy showed a "thrombotic mass of vegetations attached to the central facet of the tricuspid valve, some atheroma of the ascending aorta, spleen tumefied and enlarged, with softening of the pulp, but no abscesses.

The valvular vegetations and the thrombi of the vein were filled with micrococci, but these did not extend into the walls of the vein. The vegetation showed at the base a tissue of new formation infiltrated with new cells and passing into a granular mass at the surface, where were found degenerated cells and fibrin.

The agents of infection undoubtedly developed in the thrombus of the axillary vein, and became localized on the endocardium. Their abundance and direct transmission against the tricuspid determined the primary infection of this surface.

Similar lesions following rheumatism (?), typhoid, croupous pneumonia, tuberculosis, and other suppurative processes must be ascribed to a like localization of the peculiar infection of each malady or other septic elements accidentally introduced into the circulation.

Reports confirming the possibility of infection through slight injuries, abrasions, or ulcerating surfaces are abundant. Gilbert³_{Apr. 11} reports one from slight ulcer of lip. In this case blood taken from the various organs of the patient gave cultures, all containing one and the same microbe: Rabbits inoculated with these cultures developed valvular lesions identical with those in the human subject. The same microbe was found in these lesions, which were of the mitral and tricuspid valves, as had been used for the inoculation. In some cases an intense aortitis was developed in connection with the endocarditis. Inoculations of one cubic centimetre of a pure culture of less than twelve days always caused death of the rabbits, sometimes rapidly with spinal meningitis, sometimes later with symptoms of general paralysis after the meningitis had been successfully resisted.

Gibson-Hamilton¹⁸⁷_{v. 1, p. 200} observed a case in which ulcerative lesions of the valves with the presence of micrococci followed bruises without open wounds, and Gibert³⁶⁸_{Apr.} announces the cultivation of a single microbe, which invariably induced ulcerative lesions of the valves without previous injury or inflammatory changes. Such a fact, even if established, does not, of course, determine that any one microbe is the essential or only cause of the lesion

Pathology.—Ziegler and Tobingen¹⁰⁰⁸_{Apr. 16} reported upon the structure and genesis of the excrescences in ulcerated lesions. They find two forms of change. In the one the invasion of the specific element is followed by a granular deposit on the valves, which becomes converted into connective tissue, thus appearing as a strictly inflammatory process. Over some parts an encrusting process takes the place of fibrinous transformation. In either case the suppurative and necrotic changes are not long delayed. A second change does not present inflammatory processes but is rather a simple thrombosis. Thrombotic rather than granular deposits occur, owing to derangements of the circulation and the general condition of marasmus. Following this the changes are the same. Such processes may not be confined to the heart, but may take place on the walls of the great vessels, and become a form of arterio-sclerosis.

Symptoms.—All reports seem to point to the fact that the symptoms may be exceedingly obscure, or may simulate those of very different conditions. G. M. Humphry⁶_{Jan. 26} reports a case in

which no murmur was developed and a complicating meningitis gave symptoms such as masked the cardiac disorder. Sansom,¹⁵ gives the history of a case in which the temperature was only 101.4 at any time, and was at 100.8 at the height of the disease. While Osler¹¹²_{Oct} and Bradley¹⁴⁴_{Jan} both report cases which were mistaken for acute phthisis and the true nature of the disease was revealed only at the autopsy. The senior editor has seen during the year a case in which nausea and vomiting with gradually increasing dyspnoea and cardiac failure were the only symptoms to be obtained. No valvular murmurs, infarcts, or other evidences of the cardiac change were present, and the temperature was not above one hundred and one degrees throughout the entire course of the disease. Pawinski⁸⁴_{Apr. 22} claims that a masked tuberculosis is often behind these obscure cases. In his own case the only symptoms were a high temperature, bronchitis, and a constant and extraordinary tachycardia. Some days the pulse was as high as 200 or 220, and its usual rate was between 180 and 200. The heart sounds were all the time clear and distinct. He believes that similar cases of obscure tuberculosis may induce cardiac ulcerative lesions.

Treatment.—The only report upon treatment which offers anything new is by Sansom,¹⁵ who gives a case in which a diagnosis of acute ulcerative endocarditis was made and a good recovery followed the use of thirty-grain (two-gramme) doses of sulphocarbolate of sodium and inunctions with carbolized oil. While the valvular murmurs, which were supposed, possibly, to depend upon an old endocarditis, were not removed, all the evidences of acute lesions in the heart and septic infection were entirely relieved, and the patient left the hospital well. Not long after she returned with symptoms similar to those of the previous attack, which were not relieved the second time by the treatment. The autopsy confirmed the diagnosis of ulcerative endocarditis. The results in the first instance, however, were such as to lead Sansom to recommend strongly the antiseptic treatment.

Cardiac Abscess in Infectious Endocarditis.—H. Richardi  re⁷_{Nov. 3} reflects on the singularity of the fact that these abscesses have not been mentioned by such writers as Parrot. He attributes the omission to the fact that they have been mistaken for cardiac aneurisms in many cases. He recognizes two varieties of abscess produced by infectious endocarditis: (1) metastatic; (2) those due

to the extension of inflammation from the endocardium to the myocardium. The former occur with similar abscesses in other organs and offer nothing special. Of the second variety, he distinguishes those which occur in the thickness of the valves and do not involve the myocardium, and those which go deeper. The former are the best known, but are often described as cardiac aneurisms. The others are nearly always located near the aortic orifice, in the interventricular septum, and are often associated with a lesion of the aortic valves. These abscesses open usually into one of the cardiac cavities or into the aorta. Communication may be direct, or oftener indirect; a vegetation is tunneled, the canal forcing through the thickness of the valve. Branching and tortuous diverticula may cause different cavities to communicate. Homolle mentions a case in which a stylet entered at an aortic valve was passed successively (1) into the thickness of the wall of the right ventricle; (2) into the cavity of the left ventricle; and (3) into the right ventricle. Sometimes an abscess communicates with no cavity and is situated wholly in the myocardium. In his first case the abscess is of this class, and there was no communication with the vegetations at the aortic orifice, which is very rare. The abscesses vary in size from that of a pea to that of a walnut.

The micro-organisms found in the pus of the abscesses have been various, but always corresponded to those on the vegetations. Whether the abscess is deep or superficial and near the valve, the microbe is the immediate cause. A nodule of microbes produces the microscopic abscess, numbers of which open into each other by necrotic changes.

The general drift of bacteriological study, undoubtedly influenced very largely by preconceived opinions, has been so strongly toward the recognition of a specific and typical bacillus for each disease that the studies of Weichselbaum⁸⁴_{Sept. 1} afford a valuable check. In speaking of endocarditis he claims that pneumonic endocarditis need not of necessity be a complication of pneumonia, but that the same specific element may cause in any given case one or both diseases. His latest experiments confirm those of Klebs, Netter, and Roustan. He has succeeded in producing in animals both endocarditis and pleuropneumonia, by a culture of diplococcus pneumoniae, and he claims to have recognized a pneumonic endocarditis in seven out of thirty-three cases of the disease. Six were

of the ulcerative form and only one an endocarditis verrucosa. In five cases the lesions were of the aortic valves and a similar number were complicated by infarctions. He states, with an air of conviction, that this pneumonic endocarditis may either precede or follow the pneumonia and may occur independently without any pulmonary lesion.

PERICARDITIS.

Very little attention seems to have been given to the specific element in producing other than endocardial inflammation, notwithstanding the abundance of the work done by enthusiastic adherents of the bacterial pathology. Banti, of Florence⁶⁹ reports success in producing pericarditis in animals by cultures from the pericardial fluid taken at the autopsy from cases of pericarditis, after irritation of the pericardium by turpentine. While reporting the work of such observers, the senior editor of this department wishes to express his opposition to many conclusions drawn from such experiments. Facts are already abundant upon which to base the statement that septic matter in the circulation may induce inflammatory changes at many different points which evince a specially weakened vitality. Clinical experience shows us that very many distinct and unquestionably differentiated diseases are complicated by exactly similar inflammations of various serous membranes or degenerations of parenchymatous tissue, but the conclusion so often drawn from experimentation and too often from clinical cases, that because the action of a poison may be localized by previous mechanical injury upon the same tissue from which has been taken in another subject it is therefore the specific and sole cause of that disease, seems to us entirely unjustified.

On the contrary, the sum total of most of the experimental pathology seems to indicate only that bacteria of varied forms produce elements which are poisonous to the human system and which on introduction into the general circulation, induce either simple or necrotic inflammation in any tissue with which they come in contact and whose vitality is below what we may properly call the point of successful resistance. The universal testimony of modern pathology points to a distinct contest continually going on between the protoplasmic elements of the human body and the myriads of poisons to which they are exposed. The modern expectant and supporting plans of treatment are our tacit acknowledgment of

this fact, and they, as well as all our successful methods of treatment in the recognized parasitic diseases, bear witness to the same truth. It is rapidly becoming evident, then, that while a few bacterial elements follow specific and easily recognized lines of attack, the major part probably follow a general course, and that the form or location of the lesion produced by their presence is not proof of the form or specific character of the poisonous germ. Banti in his case is apparently leaning toward another specific bacillus.

Foureur,⁹²_{July 10} on the other hand, presents a case of primary purulent pericarditis in which bacteria were abundant in the pus but absent from the blood. The coccus was the common one of suppuration (*streptococcus pyogenes*) and inoculations of cultures caused abscesses in various parts of the animal but not pericarditis. Probably injury of the pericardium would have again localized the poison upon that surface. An interesting feature of this case was that no other points of suppuration could be found and that the blood was free from the cocci.

Bearing on treatment of pericarditis, Doubleday¹_{Sept. 1} reports results from fifty-six cases at the New York Hospital, with four aspirations of the pericardium. He advises, in case of distant muffled sounds, that aspiration should be performed and free drainage established when pus is found. Musser¹¹²_{Oct.} reports a case of pericarditis mistaken for pleurisy with effusion, and in which sixty-four ounces of fluid were found in the pericardium. J. K. Love⁶_{Feb. 18} also notes a case of pneumo-hydropericardium in which splashing sounds were constantly present.

Hasebroek²¹_{Aug. 18} reports a case of chylopericardium as something never before observed. The diagnosis was based on chemical analysis and the large percentage of fat in the fluid. He is disposed to agree with Hoppe-Seyler and others in attributing similar effusions in the pleura, peritoneum, etc., to lymphatic obstruction, stasis, and rupture.

VALVULAR DISEASE.

Riegel,⁴_{Mar. 14} in a general study of valvular lesions, distinguishes a radical and important difference, as regards prognosis, for both immediate and remote results, between stenotic and regurgitant lesions. An insufficiency does not cause an unequal distribution of blood, but does induce useless expenditure of force. Its pri-

mary tendency, therefore, is toward the development of conditions dependent upon overexertion, conditions which are remote rather than direct. Stenosis, on the other hand, induces only such force expenditure as gives immediate compensation, but does not produce early inequalities in the circulation. The author considers the difference of vital importance, and as applicable to all lesions.

In direct opposition to the above, Dusch⁶⁹ asserts that every valvular lesion, wherever its seat or whatever its nature, deranges the circulation, and that stenosis in particular decreases the results of cardiac force and thus alters the distribution of the blood. Further, he claims as his chief point that a ventral insufficiency as a secondary result causes the undamaged right ventricle to participate in the hypertrophy of the left and do more work, so that a dilatation of the right heart is an immediate consequence. The compensation, then, is only perfect for the greater circulation at the expense of increased tension in the lesser circulation, with the consequences affecting the right heart.

His general conclusion is: No valvular lesion affecting the left heart can be compensated without temporary or permanent implication of the right heart; lesions of aortic valves may be compensated, with restoration of normal conditions throughout all the arterial system, by increase of work on the part of the left ventricle. The temporary increase of tension in the pulmonary circulation, with the temporary dilatation of the right heart, then disappears, having served its temporary purpose.

Bettelheim and Kauders³¹⁹ offer some experimental results bearing upon this point. An artificial mitral stenosis was produced with the following results, a plugged cannula being employed for the purpose of controlling the mitral orifice: 1. With artificial mitral stenosis pressure sinks both in the aorta and pulmonary arteries. 2. When it was changed to an insufficiency, by unplugging, the pressure in the carotid sank, that of the pulmonary arteries rose. 3. In the course of an insufficiency either the arterial pressure remains lowered while that of the pulmonary arteries is raised, or a rise of the arterial pressure ensues later, accompanied, usually, by a rise of pressure in the pulmonary arteries, but sometimes by a fall. 4. If the insufficiency is removed, the pressure in the carotids rises again. 5. Pressure in the left auricle rises with an insufficiency, sinking again when it is removed.

6. During the insufficiency the lungs were demonstrably increased in volume.

Timofejew ⁴_{v. 25, Nos. 24, 25} has also conducted a similar series of experiments upon the aortic valves. In this case the lesion was made permanent by transfixing or tearing the aortic valve, and was in all cases an insufficiency. The following are his conclusions based upon a large number of observations: 1. The diastolic "murmurs" of aortic insufficiency may entirely disappear and be replaced by a "sound." 2. The intensity of the murmur depends on (a) the amount of insufficiency, (b) on the blood pressure in the aorta. 3. Blood pressure diminishes in the course of time with valvular lesions. 4. The second sound in the dog's carotid sooner or later entirely disappears with aortic insufficiency. 5. The second murmur that is often heard with aortic insufficiency in the carotid is not diffused but is purely local. 6. The first murmur heard in the carotid with aortic insufficiency may be purely local.

Again, in direct opposition to this, are the observations of Rosenbach, ⁴_{Sept. 17} who claims to have anticipated the methods and deductions of Timofejew, as far as they are correct, and who maintains that the strength of the diastolic murmur is not specially affected by the pressure in the arterial system, which is then at a minimum; that the murmur is chiefly due to the aspiratory action of the dilating left ventricle; that the murmur is due to the retrograde flow of blood due to this aspiratory action, which the systole of the ventricle must overcome and roll back again. The necessity of overcoming this retrograde flow is the chief factor in the production of the hypertrophy that ensues. He also alludes to a muscular mechanism of the ventricular wall that aids the valves in closing, and further shows that tension in the arterioles at the periphery is a matter of moment in this condition of things.

It appears to us, and the diversity of opinions expressed supports the belief, that such experimental evidence is at present of comparatively little profit. The effects of lesions of the valves in disturbing circulation and inducing secondary changes in the muscular apparatus of the heart have been more clearly and undeniably manifested in clinical cases than can ever be the case in such artificial conditions, and post-mortem examinations coupled with clinical histories offer a far safer basis upon which to found valuable deductions.

Valvular murmurs as such have fallen so much into the background during the past few years and have been replaced as important elements of prognosis so entirely by the secondary changes in cardiac walls, that their intensity, diffusion, and quality no longer attract special attention. Heinemann⁵⁹_{Dec. 17} has presented a paper which, with the discussion following, presents with sufficient fullness our views upon this subject.

As bearing upon the diagnosis of valvular murmurs, Bramwell and Murray²_{Jan. 7} present the details of an ingenious arrangement by which they hope to solve the question, so sharply discussed in the English press and noted in the ANNUAL last year, concerning the relation of the presystolic murmur to the cardiac systole, or, more exactly, to the closure of the mitral valve.

In our minds there is no question as to the murmur. We cannot accept the theory that every mitral stenosis causes no murmur, but is associated with a mitral regurgitation which does induce such a markedly different murmur from those which are admitted by all to be distinctly regurgitant. The question, however, was sufficiently discussed last year.

Keating¹⁹_{Feb. 1} suggests, basing his belief upon a case, that an aortic systolic murmur characteristic of obstruction may be produced by pressure upon and diminution in the calibre of the aorta by a distended right auricle or even the pulmonary artery. It would be sufficient to suggest the possibility, as any such lesion would almost of necessity depend upon such changes as would produce characteristic symptoms.

The peculiarities of cardiac lesions and murmurs are well illustrated by a case reported by Middleton²¹³_{July} in which a mitral and tricuspid stenosis were both found on autopsy, where there had been no auricular-systolic (presystolic) murmur present during life; and by Gardner's case,²¹³_{July} in which an auricular-systolic murmur was present and found post-mortem to depend upon an extreme aortic regurgitation. This case confirms what was taught by Flint many years since, regarding an aortic regurgitant murmur simulating that of mitral stenosis.

It is at times not easy to determine post-mortem whether a valve has been actually incompetent during life, and Hamilton²_{Apr. 20} suggests the use of a pneumatic test, employing a bellows

which has both suction and expulsive power, to be used before the heart has been cut into at all.

The uncertainty of prognosis when based upon valvular murmurs alone is illustrated by many reported cases, called out, doubtless, by Sir Andrew Clark's article of 1887, of which one by Fowler² may be a sample. In this case a double aortic and mitral regurgitant murmur remained stationary without causing even progressive changes in the heart muscle for fifty-four years. Such extreme duration is doubtless rare, but proves the capabilities of cardiac compensation and the possibility of arrest in the valvular lesions.

All valvular lesions, however, must react sooner or later upon the myocardium, and it seems not an unfair statement to say that of all cardiac diseases those of the myocardium must demand our most thorough attention and give us the greatest interest.

MYOCARDITIS.

Perhaps the most important contribution of the year on this subject is that of Riegel.¹¹⁴ The author dissents from the conclusion that the symptoms of chronic myocarditis are too vague to offer grounds for a diagnosis, and which, therefore, causes the average diagnostician to content himself with a diagnosis of "cardiac weakness" or "cardiac insufficiency." His conclusions are based on various observations, but especially on one case which was closely studied for the space of four years:—

A perfectly healthy man began to complain of shortness of breath and oppression in the chest about six weeks after receiving a kick from a horse on the breast. At the time of injury he was disabled, and remained without any marked symptom of cardiac disease for about three weeks. The heart's action then became extremely irregular and uneven. At times it was remarkably accelerated and then became extremely slow. The pulsations varied greatly in force as well as frequency. The area of absolute cardiac dullness underwent considerable fluctuation, extending at times to the right border of the sternum and then receding to the median line. It also extended upward as far as the fourth rib. Increase in the area of the liver, dullness, and œdema were apparent when the cardiac failure was evidenced by decrease in the amount of urine.

These symptoms, however, always disappeared on the restoration of free diuresis, whether that was spontaneous or induced by the use of digitalis. Cyanosis and epigastric pulsation invariably accompanied the other evidences of obstructed circulation. Relief from this condition was obtained repeatedly, usually by means of digitalis, but the irregularity of the pulse was unchanged, indicating that muscular weakness was not the sole cause of the disturbed cardiac rhythm. The area of cardiac dullness and epigastric pulsation, however, were distinctly reduced when the diuretic action of the digitalis became manifest. At the time of the patient's last admission the increased area of dullness had returned. There had developed a systolic murmur, heard at the apex but louder over the seat of the tricuspid valve; the heart sounds were clear, and the second sound was not accentuated; the radial pulse was small, easily compressed, and about half as frequent as the cardiac pulsations. The area of hepatic dullness was increased and epigastric pulsation was prominent. The urine was scanty and there was œdema and bloody expectoration. In spite of full doses of digitalis and strophanthus the pulse became weaker and terminated in collapse attended by slight jaundice.

The diagnosis had been chronic myocarditis, dilatation of left ventricle, secondary stasis and dilatation of right heart with "relative insufficiency of the tricuspid, hepatic congestion, and hæmorrhagic infarctions of the lungs."

Any one seeing the case only when the area of cardiac dullness was at its extreme, when there were systolic murmurs at the mitral and tricuspid valves, with cyanosis, enlarged liver, and venous pulsation, must have diagnosticated it as the uncompensated stage of valvular disease.

When, however, under the action of digitalis, the area of cardiac dullness was reduced to normal, the murmurs disappeared, and the heart sounds became clear, clean cut, and of normal relative intensity, the case presented a very different picture, but one in which the irregular action of the heart became almost a pathognomonic sign. This symptom was never changed from the earliest history of the case.

As for the murmurs, they made their appearance late in the disease, and one might, as has been said, have been doubtful as to the presence of some valvular disease. But the systolic murmur was

loudest over the tricuspid orifice, not so loud but of the same character at the apex. This decided that the tricuspid was the seat of origin of this murmur, while epigastric pulsations are an absolutely sure sign of tricuspid insufficiency; therefore the only remaining questions would be whether the mitral also was insufficient, and whether both were endocardial murmurs or if there existed a "relative" (or secondary) insufficiency. The clinical observations settled this point. The murmurs only came in connection with defective compensation and especially when this was manifested by considerable increase of the area of dullness. They disappeared as soon as the digitalis had produced its effect, whereas an endocardial murmur would not have disappeared, but rather become more intense with the increase of cardiac force.

The histological diagnosis after the autopsy gave: Fibroid, myocarditis of the left ventricle, mitral stenosis, dilatation of the left ventricle, eccentric hypertrophy of the right ventricle with extensive fatty degeneration, and relative insufficiency of the tricuspid.

(a) *The Diagnosis of Mitral Stenosis.*—On this point the autopsy seems to contradict the clinical diagnosis. During life no symptoms of the mitral stenosis manifested themselves. But in no cardiac affections are the symptoms more variable than in mitral stenosis. Murmurs are for all valvular disease far less decisive than are those resulting manifestations that the disease sets up in the venous and arterial systems. Murmurs may deceive, but every valvular lesion must produce specific results which are of greater significance than the murmur. A mitral stenosis must necessarily produce a congestion above it, and beneath it a deficiency of blood. In the left auricle there must be stasis with dilatation and secondary hypertrophy, while the left ventricle will have too little blood. Now a glance at the pulse-readings of this case shows that actually there was no stenosis worth speaking of. The pulse was quite constantly large and full, which in any "outspoken" mitral stenosis it could never be; it therefore cannot figure at all as a causative factor in disordering the circulation. It need scarcely be said that, had there been a noteworthy stenosis of the mitral orifice, a concentric atrophy of the left ventricle, instead of the dilatation we find, would have been the result.

That the fatty degeneration of the right ventricle could not have been the primary disease is shown by the long duration.

The fatty degeneration must be regarded as a late complication, and the primary change one of myocarditis.

(b) *The Diagnosis of Chronic Myocarditis.*—The author believes that such a diagnosis can often be made with certainty. According to the best authorities, the clinical picture of chronic myocarditis is identical with that of valvular disease when compensation ceases. But in his opinion the irregularity of the heart's action, the total loss of rhythm, is the characteristic feature of myocarditis and is pathognomonic. Though there are sixteen several causes named for such irregularity, yet in those other diseases the irregularity is always a late manifestation, and is due to an insufficiency of the heart muscle that is secondary to other disease. In the case recorded, the patient was seen very early in the course of the disease, before there was any hypertrophy, and the irregularity was already present. This irregularity never disappeared; although all the other symptoms—stasis, dropsy, etc.—went and returned repeatedly, the rhythm remained the same. In all other cardiac affections the regularity of the heart's action is restored as soon as digitalis or other heart tonics have wrought their effect. Also, in other heart affections the irregularity comes in when the heart loses its power. If the power is restored by tonics, the regularity also comes back; not so with myocarditis. The author believes that the cause of the irregularity must be sought in the intrinsic nerve supply of the heart, as we cannot otherwise explain the fact that both the very small hearts and the large, powerful hearts show this irregularity in an equal degree. He also traces the course of events consequent upon the loss of muscular tissue which ensues upon the advent of fibroid degeneration. The left ventricle primarily becomes unequal to the demands made upon it. This is manifested by dilatation, increased area of dullness, and small, weak pulse, and is attended by a stasis which gradually works backward through the lung upon the right heart and veins. In this respect the process resembles, indeed, and is identical in its results with, failing compensation in valvular disease. It will be found, however, that in cases of myocarditis the rhythm is disturbed early, and is not restored even when the functional activity of the heart is regained. Such irregularity cannot depend upon muscular weakness alone, and we are forced to the belief that it depends upon some defect in the nerve supply.

(c) The diagnosis of relative tricuspid insufficiency is, of interest only as pointing to the changes which may take place at the tricuspid opening as the heart dilates and contracts. A systolic jugular pulsation is, of course, a pathognomonic sign, and when associated with pulsation in the abdominal veins the extent of the regurgitant current can be approximately estimated. In this case the venous pulsation in the abdominal vessels was distinct and characteristic, the vein filling with comparative slowness and being more rapidly emptied. What is of importance, however, is the fact that when, under the use of digitalis, the area of cardiac dullness decreased, this venous pulsation disappeared with the other evidences of valvular trouble. So long as the venous pulsation was marked there was no accentuation of the second sound, but with loss of pulsation and the apex murmur this sign returned.

(d) *Therapy.*—The author considers it important, as well as possible, to make a clear distinction between the dilatation following compensatory hypertrophy and that which is primary. The line of treatment in the two cases is, nevertheless, quite uniform. He does not consider mere frequency of cardiac action an indication for the use of digitalis, but depends upon the evidence of non-compensation to determine the drug to be given. Digitalis in such cases often appears to increase the frequency of the pulse by giving force to those frustrated half-beats which before did not send a pulse-wave to the smaller arteries.

He relies upon the powdered digitalis entirely and abandons it altogether if the desired effect is not obtained in two or three days. He has found all other drugs ineffectual in his cases except caffeine, and this much less powerful than digitalis.

We have given the foregoing discussion and case in full, not because we coincide with all the points, but because the case illustrates in a broad way the subject of cardiac degeneration in general, in which we have been particularly interested of late. In this case the etiology is of no importance, as it can but rarely explain the cause of cardiac degeneration. Without entering into details, it may be said in general that the causes of cardiac degeneration include all the causes of defective nutrition, either local or general, *i. e.*, (1) interference with the coronary circulation; (2) deficient or abnormal elements in the blood. Among the most prominent of these last is chronic Bright's disease. The views of the

senior editor upon this subject ¹¹⁸⁷ may be briefly summed up in the statement that the characteristic pathological change in the heart caused by Bright's disease is one of degeneration, dependent upon the defective nutrition supplied by blood laden with the uneliminated products of waste tissue. Some of the deductions drawn by the author of the above article seem hardly justified by the facts. While cardiac degeneration may of itself induce irregular rhythm, the author's own statement that this irregularity depended upon disturbance of the intrinsic cardiac nerve supply weakens his argument when claiming that irregularity in rhythm is an invariable sign of degeneration when not accompanied by other evidences of valvular lesions.

Personally, we are inclined to the belief that there is no single symptom which can be relied upon as a sure indication of myocarditis. Muscular weakness and defective nervous control enter into the question of cardiac rhythm in such varying proportions and under such varying conditions that disturbed rhythm, even when permanent, can hardly be regarded as proof of degenerative changes of the myocardium. Even disturbance in the coronary circulation may quite possibly cause as much cardiac failure in the nervous element as in the myocardial. The diagnosis must be negative rather than positive. Absence of the distinct evidences of valvular disease in connection with arrhythmical action of the heart becomes of itself a positive sign. We must also question whether the author attaches sufficient importance to the mitral stenotic lesion. A traumatic myocarditis is certainly rare, and the effects of valvular lesions do not depend entirely on the amount of disturbance they cause in the circulation, nor is their disturbing effect always measured by the apparent extent of the lesion post-mortem.

Notwithstanding these criticisms, we wish to enforce the lesson deduced by the author, and add our expression of belief that myocarditis is too often overlooked, and impress the fact that differential diagnosis is of the utmost importance.

In speaking of the pathology of myocarditis, Steffen ³⁶⁶ Ed. 27, H. 2 notes its occurrence in children, either as circumscribed patches throughout the organ or as a diffuse change. He states that in such cases it is especially apt to depend upon some septic or infectious disease, as diphtheria and pyæmia. The histological descriptions of the changes attendant upon septic myocarditis heretofore reported by

Leyden, Zenter, and Hayem have received verification in a case⁹² recently reported. These changes consist of a granular degeneration of the muscle-fibres, in which the nucleus becomes free and enlarged in the midst of the general granular mass; two or three nucleoli being usually found in each nuclear mass. The striated appearance of the muscle is soon lost.

In some cases the degenerative changes partook of the vitreous character in some fibres, but this was never the sole change present. The internal perimysium showed an increase of cellular elements in the connective tissue. These rounded or fusiform cells have a large nucleus of transparent protoplasm. They were described by Hayem as the myoplastic bodies, and represent a return to foetal types.

Sclerosis of the myocardium is a less frequent form of degeneration, but is of special importance from its connection with general sclerotic changes, and especially when found in patients of a fibroid diathesis and in connection with arterial sclerosis.

Huchard,³ describes a case characterized during life by paroxysms of intense dyspnoea, in which the autopsy revealed quite marked sclerosis of the coronary arteries and myocardium. Atheroma of the coronary arteries cannot be considered as especially infrequent or of marked interest; nevertheless, Huchard insists again upon the distinction being carefully made between vascular and valvular diseases of the heart—a distinction which has practically been discussed, so far as secondary results in the cardiac walls are concerned, in speaking of chronic myocarditis. Huchard's case presents one point of extreme interest, as showing that sclerosis may be localized exclusively in the coronary arteries, and that when so localized, as well as when a part of a more general change, it evinces the same tendency to extend to the myocardium, both by direct extension and through nutritive disturbances in the cardiac muscle. Girode,⁷ reports a typical case of myocardial sclerosis in connection with similar changes in other organs. The patient came of a rheumatic family, and suffered from two attacks of acute rheumatism. The autopsy showed, aside from the lesions of the mitral and aortic valves, fibroid developments scattered in patches throughout the myocardium and attended by marked cardiac hypertrophy. The histological examinations showed similar sclerotic changes in the liver and kidney.

Steven⁶_{Dec. 24, '97} has also reported the results of his somewhat extensive studies upon the subject of fibroid degeneration and allied lesions, as relating to the heart and coronary arteries more particularly. He gives a summary of his conclusions, as follows: 1. A very sharp distinction must always be drawn between true atrophic fibroid degeneration and interstitial myocarditis; although similar in their results they differ very markedly in their mode of production, and the former is the much more common lesion than the latter. 2. We should not be satisfied with merely opening the heart and examining the endocardium and valves, as is too often the case at a post-mortem examination, but in all cases the muscular tissue should be carefully examined by numerous incisions both parallel and at right angles with the line of the muscular fibres. 3. The anastomosis of the coronary arteries is not so free as to be of any practical moment, especially when these vessels are diseased, in presenting the occurrence of fibroid degeneration or of infarction of the heart as a result of the obstruction of their branches. 4. The influence of a morbid state of the coronary arteries must be taken into account in considering all diseases of the heart, but especially those of the myocardium, and no examination of the heart can be regarded as complete which does not include a careful investigation of the state of these vessels. 5. Although admittedly difficult, the possibility of diagnosing fibroid degeneration and infarction of the heart should always be kept in sight, and by carefully passing in review the whole symptomatology and pathology of a given case of cardiac disease a correct opinion in this regard may possibly be arrived at.

What has already been said in discussing myocarditis will apply equally to this point of sclerosis. It is true that at times a diagnosis can be made with considerable certainty, and in every case where the diagnosis is the more general one of cardiac failure, the utmost pains should be taken to ascertain the cause, since treatment must be materially modified by the etiology, but in the majority of cases the ultimate point of diagnosis must be a differentiation between cardiac failure following hypertrophy and primary cardiac degeneration, and in the majority of cases we shall be compelled to treat what we are forced to recognize clinically as simply a failing heart.

Bruce¹⁵_{Jan.} has reviewed the subject of cardiac failure and has

tabulated the causes, all of which tend directly to some form of myocardial degeneration, as follows: 1. Overwork. 2. Defective nerve supply or control. 3. Deficient nutrition, from (a) disease or obstruction of vessels, (b) impoverished or poisonous blood. 4. Reflex vasomotor or sympathetic irritation (genitourinary). 5. Limit of compensation.

We have decreased the number of headings somewhat by classifying a little more broadly. His statement that prognosis is good only when the cause can be removed is almost an axiom.

Fenwick⁶_{May 28} has again drawn attention to the etiological relations which increase of abdominal pressure, and more especially that which is uneven, as from tumors, may bear to cardiac degeneration and consequent failure. He believes that many cases of sudden death following removal of abdominal tumors may be traced to cardiac failure incident to the sudden strain which follows the decrease in abdominal pressure in a heart that has undergone fatty degeneration as a result of the upward pressure by the abdominal disease. It becomes important, then, to determine the condition of the heart muscle before undertaking any operation on the abdominal cavity which will cause rapid decrease of intra-abdominal pressure and the consequent re-arrangement of the circulation. It is possible that delivery at full term may operate in the same way in patients whose nutrition has suffered severely.

A final and important source of error in relation to cardiac failures lies in mistaking the fatty heart of obesity for a true fatty degeneration. Forchheimer⁵_{Oct.} contributes a discussion on the fatty heart of obesity which is a fair *résumé* of our knowledge upon the subject. The pathology, he states, is primarily a fatty deposit on the heart and within its substance between the fibres. The inevitable pressure which such deposit makes may result in the development of a true fatty degeneration. The etiology is that of obesity in general, the symptoms, so far as they refer to the heart, simply those of cardiac failure, and the treatment as for the general condition.

Potain,³_{Sept.} in commenting upon several cases of cardiac hypertrophy following painful lesions of the brachial plexus, concludes that the order of pathological change is (1) local irritation; (2) nervous control of heart weakened (reflexly), causing decreased resistance, passive dilatation under systole, and compensatory

hypertrophy which is eccentric. The prognosis is good if the signs of excessive action cease on removal of cause.

That apparent functional disease may in fact depend upon appreciable organic lesions is considered by several authors, but especially illustrated by a case reported by Hallopeau,²⁸⁷ in which the diagnosis, arrived at and confirmed only by the results of treatment, was of tertiary syphilitic deposit in the cardiac plexus or so near as to cause irritation by contiguity. The symptoms were those of a severe angina, more or less intermittent, which was not affected by any of the usual remedies, but was entirely relieved by large doses of the iodides. Although the iodides are supposed to have some direct influence on arterial change and do undoubtedly affect vascular conditions, it was impossible to suppose that results would have been so immediate or so permanent had the angina depended upon either arterial disease or other vascular changes. The direct opposite error in diagnosis is illustrated as a possibility by a case of Huchard's,³ in which the anginal pains resembled most strongly those of gastric ulcer both in character and intermittence. Huchard, however, in commenting on the case, insists most strongly that the diagnosis must not rest upon either the character or location of the pain, but upon the presence or absence of hyperarterial tension. Since the danger to the patient as well as the cause of the angina lies in high tension and ischæmia of the cardiac muscle, one must watch patients in whom such conditions are liable to develop, that the treatment may be prophylactic. Therapeutically, Huchard advises the iodides and trinitrin.

Treatment of Cardiac Degeneration.—The literature bearing on the treatment of cardiac degeneration, of whatever form, covers no new ground.

The Oertel treatment still causes more or less animated discussion. After a very interesting discussion on this subject, Oertel gave his own conclusions regarding his method, as follows^{118, 5}:—

1. Only good results are obtained in the mountain resorts (*Terraincurorte*) in the latter stages of fatty heart, where there is no evidence of sclerosis of the coronary arteries, occurring usually in persons advanced in years, with serous plethora, venous congestion, and often œdema. These good results consist in increase of the heart's strength, a regulating of its action, increase of albuminous

matter composing it, and often a decrease of its amount of fat. There is also an increase of the general bodily powers.

2. There is further obtained by this method, in cases of valvular disease, or of obstruction to the pulmonary circulation, an increase of the muscle substance of the heart, and the production of compensatory hypertrophy.

3. Extensive non-compensatory dilatation, resulting from diminished strength of the heart muscle and increased intra-cardiac pressure, in not too chronic valvular lesions in young people, is made to disappear.

4. There is obtained the most complete possible adjustment between the arterial and venous apparatus, together with increase of the quantity of blood and of the pressure in the aortic system, and diminution of cyanosis and of œdema.

5. Diminution and complete disappearance of disturbances of the respiratory apparatus, especially of the rapidly developing dyspnœa and oppression, are obtained.

As regards the permanence of the good results produced through this dietetic-mechanical treatment, time only can decide; but the author has patients in whom the restored compensation has lasted at least twelve years.

Lichtheim's conclusions, in his address delivered on the same occasion as that of Oertel's, ^{116 5}_{p. 301; Aug.} are as follow:—

1. Oertel's method is a sovereign means of cure for those forms of chronic heart-disease whose genesis is due to intemperance in eating and drinking and to lack of bodily exercise.

2. In those diseases of the heart, on the other hand, due to the dilating influences of immoderate bodily exercises, or other causes, this method is of no value. Bodily exertion is only to be allowed in moderation and when there is tolerable compensation, and it must never be allowed to produce much dyspnœa. This class of cases is to be treated much more carefully than are instances of real valvular disease.

3. The treatment with digitalis, strophanthus, and caffeine remains the principal one for disturbances of compensation. Where the use of drugs fails, the dietetic method is also of no avail. Only in the removal of hydrosis is Oertel's method of real assistance to the treatment with drugs, though it can never take the place of the latter.

4. During the period of intact compensation the use of medicaments is superfluous, and Oertel's method, used in moderation, finds its true field.

By physiological bradycardia he understands cases observed in healthy persons, or where the complaint for which the person was under treatment had no connection with the slow pulse, and the affection was not associated with any symptoms which could be attributed to it. Idiopathic bradycardia is seen where the circulatory apparatus is healthy and the other organs are not the seat of any disease, but where a slow pulse and troubles dependent thereon are seen as an independent affection. Cases grouped under the term "symptomatic bradycardia" are those where a slow pulse is observed as a transitory phenomenon in the course of some disease, and such slowness of pulse is only to be regarded as a casual connection. This group comprises by far the greatest number of the cases observed, 93 per cent. of all cases of bradycardia coming under it. Grob draws the following conclusions from his own observations on one hundred cases, and from a consideration of forty other cases recorded by various observers:—

1. It is in the highest degree probable that bradycardia or slowness of the pulse may be found as an independent neurosis.
2. The slowness of the pulse is frequently associated with symptoms, the most common ones being attacks of fainting, feeling of oppression in the cardiac region, epileptiform and apoplectiform attacks, seizures of dizziness and feelings of weakness.
3. Bradycardia is not uncommonly associated with rheumatism.
4. Males are very much more frequently the subjects of bradycardia than females.

THE PULSE IN HEART-DISEASE.

When so much reliance is placed upon the pulse in the diagnosis of cardiac disease, the purely functional causes which may induce an irregular or abnormal rhythm become of special interest. A rapid pulse is quite frequent in cardiac disease, but slowed pulse is more frequently significant of cerebral than cardiac disease, and when the cause is located in the cardiac apparatus it is quite probable that the nervous element is at fault.

Grob ³²⁶_{3d, 4th, 5} has contributed to our knowledge of slowed pulse. He uses the term bradycardia to distinguish a series of phenomena associated with slow pulse, bradycardia having been proposed by

Eichhorst as a suitable term in contradistinction to tachycardia where there is a rapid pulse.

Grob considers cases to come within the scope of the term bradycardia in which, during observations extending over a series of days, the pulse did not reach, on more than one occasion, the rate of sixty beats per minute. Employing the term in this sense, he has observed one hundred cases of bradycardia, and he classifies them under three headings:—

1. Physiological bradycardia.
2. Idiopathic bradycardia.
3. Symptomatic bradycardia.

CONGENITAL CARDIAC DISEASE.

Cardiac cyanosis, which was, perhaps, more properly put as congenital disease, is the title of a paper by Fallot,⁴⁶ in which he states his conclusions regarding the causes which induce congenital cyanosis. With few exceptions, he thinks all cases can be included under the heads of (1) stenosis of the pulmonary artery; (2) inter-ventricular communication; (3) displacement to the right of the aortic opening; (4) hypertrophy (nearly always concentric) of the right ventricle.

Although potency of the foramen ovale is usually present, the author considers that it is entirely insufficient to give the symptoms in the degree they are often found.

He also denies the affirmation that inoclusion of the septum ventriculorum can, in any manner, be considered as a reversion to the vertebrata with a single ventricle. Such a condition is as truly a simple failure of development as any that appears upon the tegumentary surfaces, and can be regarded as nothing more. Moreover, the clinical facts show that the symptoms are due to the pulmonary stenosis more than to any other condition. This stenosis, the author believes, depends upon intrauterine pathological processes which can hardly be supposed to be anything more than inflammatory, *i.e.*, an endocarditis of uterine origin, which by preference attacks the right heart. When this pulmonary stenosis occurs before the seventh week, it prevents the occlusion of the interventricular septum, and induces a hypertrophy of the right ventricle that produces a deviation of the aorta.

If such an endocarditis can be possible and is induced by any condition of the maternal circulation, such as induces endo-

cardial inflammation in the adult, it certainly is a part of good practice to bear such possibility in mind when caring for the health of a pregnant woman.

Morison¹⁵_{Feb., Mar.} also presents a long and complete discussion of this same condition, based upon a large number of cases in which the histories were given in the "Transactions of the Pathological Society of London." These were divided into classes: (1) those in which no cyanosis was present; (2) those in which cyanosis existed in only a moderate degree; (3) those in which the cyanosis was very great.

From these cases he attempts to draw up some general law regarding the effects upon the circulation, and especially in producing cyanosis of the various lesions of congenital malformation, and offers these statements:—

"The salient facts to be taken into consideration in coming to a rational conclusion as to the mechanism of cyanosis, in cases of cardiac malformation, may now be concisely stated to be the following:—

"1. In a considerable majority of cases (71 per cent.) the ductus arteriosus was patent. 2. In *these* only 23 per cent. had a pervious pulmonary orifice, as compared with 77 per cent. in the group in which the ductus arteriosus was closed, while this ratio was nearly reversed as regards closure of the pulmonary orifice. 3. The ratio in which the foramen ovale and ventricular septum was open was more equal in both classes, while that in which these parts was closed was nearly double in the second class as regards the foramen ovale, and somewhat higher also as regards the ventricular septum. On the other hand, a simultaneous perviousness at these points was considerably higher in the first than in the second class, and a simultaneous closure was met with only in 8 per cent. of the first, and was quite unknown in the second series. 4. The *general* range of cyanosis was higher in the second than in the first class, but more equal, and (5) notwithstanding this, the duration of life in the second was nearly twice that in the first group. 6. As regards the relative significance of special lesions in cyanosis, naturally closure of the pulmonary orifice, and patency of the foramen ovale and ventricular septum, were the most frequently associated with it, while, conversely, patency of the pulmonary orifice and closure of the foramen ovale and ventricular

septum, being approaches to the conditions of the normal circulation, were associated with a relative absence or minor degree of that state. 7. To this rule, however, there is an exception in the case of closure of the foramen ovale in the second group, in which that anatomical fact was coupled with an equal ratio (20 per cent.) of freedom from cyanosis, and a minor degree of that condition, and at the same time with no less than treble that ratio (60 per cent.) of cyanosis in a pronounced degree. This circumstance can, I think, only be explained by the greater longevity of patients in the second series, and by the fact that the ultimate degree of cyanosis in such cases is alone noted, and thus, while an apparent exception to the rule mentioned, in reality it supports it. The conclusion to be drawn from these facts is that the normal diversion of a great volume of blood lung-ward on the distal side of the venous heart fails to occur in the great majority of cases of *morbus cœruleus*, and that, consequently, there is a notable diminution at once of pulmonary aspiration and aëration."

As a natural result, the lung becomes partially collapsed, respiration is impeded, and even that blood which passes to the lung is not probably aërated. The author seems to consider this as perhaps the most important element in determining the cyanotic condition. He states that an open ductus arteriosus may often be an advantage rather than the contrary. The subjoined table illustrates more briefly than can otherwise be done the conditions present. P. O. = pulmonary arterial orifice; F. O. = foramen ovale; V. S. = ventricular septum; Cy = cyanosis; O. = perfect occlusion or separation, applied to cyanosis absence; — = constriction or a minor degree of patency; + = a greater degree of patency in the condition noted, and ? = uncertainty.

As regards diagnosis, Morison states that the murmurs are not usually characteristic. They are, however, generally superficial, loud, or rasping in character, and not located in the usual areas of valvular murmurs. In most cases they are systolic in rhythm, and, though located perhaps with greatest intensity near the base of the heart, they cannot be held as indicating with any certainty the exact nature of the defect. Of course, some cases may present themselves in which peculiar conditions will enable one to form at least a probable diagnosis as to pathological condition inducing the murmur.

ANALYTICAL TABLE.

DUCTUS ARTERIOSUS OPEN.—FORTY-SIX CASES.

P. O. open in 14, or 23 per cent.	P. O. closed in 34, or 73 per cent.	F. O. open in 24, or 15 per cent.	F. O. closed in 7, or 76 per cent.	V. S. open in 38, or 23 per cent.	V. S. closed in 11, or 38 per cent.	F. O. and V. S. open in 27, or 8 per cent.	F. O. and V. S. closed in 4, or 13 per cent.	Age in 7, or 15 per cent.	Age in 17, or 38 per cent.	Age in 13, or 28 per cent.	Age in 8, or 6 per cent.	Cy + in 4, or 41 per cent.	Cy + in 13, or 28 per cent.	Cy ? in 10, or 21 per cent.
Cy	Cy	Cy	Cy	Cy	Cy	Cy	Cy							
1	1	1	1	1	1	1	1							
2	2	2	2	2	2	2	2							
3	3	3	3	3	3	3	3							
4	4	4	4	4	4	4	4							

DUCTUS ARTERIOSUS CLOSED.—EIGHTEEN CASES.

P. O. open in 14, or 77 per cent.	P. O. closed in 4, or 22 per cent.	F. O. open in 12, or 68 per cent.	F. O. closed in 5, or 27 per cent.	V. S. open in 18, or 73 per cent.	V. S. closed in 5, or 27 per cent.	F. O. and V. S. open in 7, or 38 per cent.	F. O. and V. S. closed in 0, or 0 per cent.	Age in 0, or 38 per cent.	Age in 6, or 88 per cent.	Age in 12, or 68 per cent.	Age in 0, or 11 per cent.	Cy + in 8, or 44 per cent.	Cy + in 8, or 44 per cent.	Cy ? in 0, or 0 per cent.
Cy	Cy	Cy	Cy	Cy	Cy	Cy	Cy							
1	1	1	1	1	1	1	1							
2	2	2	2	2	2	2	2							
3	3	3	3	3	3	3	3							
4	4	4	4	4	4	4	4							

DUCTUS ARTERIOSUS DOUBTFUL.—ELEVEN CASES.

P. O. open in 7, or 66 per cent.	P. O. closed in 3, or 27 per cent.	F. O. open in 6, or 54 per cent.	F. O. closed in 3, or 27 per cent.	V. S. open in 3, or 27 per cent.	V. S. closed in 0, or 0 per cent.	F. O. and V. S. open in 3, or 54 per cent.	F. O. and V. S. closed in 0, or 0 per cent.	Age in 1, or 9 per cent.	Age in 4, or 38 per cent.	Age in 6, or 54 per cent.	Age in 0, or 11 per cent.	Cy + in 3, or 27 per cent.	Cy + in 3, or 27 per cent.	Cy ? in 8, or 27 per cent.
Cy	Cy	Cy	Cy	Cy	Cy	Cy	Cy							
1	1	1	1	1	1	1	1							
2	2	2	2	2	2	2	2							
3	3	3	3	3	3	3	3							
4	4	4	4	4	4	4	4							

The lungs are often normal on physical examination, and seldom show more than puerile respiration. They are commonly dry, and when the diversion of blood is extreme may give slight evidence of the decreased ratio between air and lung-tissue.

Cyanosis is the most constant symptom and is present in 90 per cent. of the cases of cardiac malformation.

When this cyanosis is very well marked in early life, it is quite certain evidence of a patent ductus arteriosus and that the patient's life will be short. The treatment for this condition is more general than special. Nutrition is maintained by the most readily assimilated food and such as does not contain a large proportion of fluid, since it is desirable to maintain rather a low arterial pressure.

The circulation may be favored in the lung by position and still more by artificial aspiratory respiration, while the general blood tension and the congestion of the systemic circulation may be relieved by careful blood-letting. On the pulmonary side, measures tending to expand the lung without increasing the intrapulmonary pressure of air tend to expose the blood to a more rapid aëration, which may be markedly assisted in some cases by the use of oxygen.

We would suggest that the methods of pneumatic differentiation might be applied to these cases to induce a greater determination of blood to the lung. Anodynes will be required in some cases and later, as failure of cardiac force develops, some of the cardiac stimulants will for a time give relief. That life may be prolonged for some years under these circumstances is shown by the reports of cases living to the ages of twenty-three and thirty-three years.

A case is also reported,² in which arrest of development was still more extreme and involved the interventricular septum.

Ectocardia.—Lannelongue⁵⁵ gives a unique case of ectocardia, in which the apex of the heart and a portion above were uncovered and were successfully protected by a plastic operation. It is reported as the only case on record in which the operation has been attempted. Two months later the child was doing well.

CARDIAC INJURIES.

Numerous reports are made of various forms of cardiac injury, most of which are curiosities in medical literature rather than of

practical value. They all point, however, to the one general fact that the heart is more tolerant of injury than is commonly supposed. Peabody⁹_{Oct. 20} gives a case in which a pin became imbedded in the heart-wall with a portion projecting into the ventricular cavity, without causing any symptomatic evidences of its presence. A still more important case is reported by Kiawkoff³³⁶_{p. 221} in which a stab-wound of the heart was recovered from within five weeks, the wound being apparently entirely closed. Death resulted from secondary rupture of the heart at the seat of the wound under the increased tension induced by a sudden strain. The possibility of rupture of the cardiac valves under severe strain is illustrated by several cases, which should impress upon the physician's mind the dangers attendant upon too violent and sudden strain, such as is often indulged in by athletes.

Richardson²²_{v. 3, p. 578} instances some peculiar injuries of the heart. In the first a rupture of the aorta was induced by what he considers the water-hammer blow, the patient falling some distance and landing on his feet. In the second an acute dilatation of the aorta was induced by a somewhat similar accident, and in the third a fall while the patient was exercising produced an extreme disturbance of the nervous control of the heart.

COMPLICATIONS.

Jaccoud³_{May 20} has presented a valuable and most interesting article upon the relations of certain acute diseases to pre-existing cardiopathies and such as may be developed in after-years. The paper will perhaps be of special interest to those who are inclined to give pathogenic germs a special place in the etiology of all diseases. Although practically admitting that germs may remain inactive in the cardiac tissue for protracted periods, he states that all cases of endocarditis dependent upon germs long present in the endocardium, which become active only when the resistance of the tissue is weakened by general malnutrition or by the action of some autopoison, must be called primary endocarditis. Such germs may be the immediately exciting cause, but cannot develop until the restraining influence of healthy tissue is removed. In this connection he refers to the demonstrations that germs have been found in the saliva of patients who long subsequently suffered from pneumonia. This interval has been as much as thirteen years. It

appears to us that it will require a stretch of faith and imagination, even in the most devoted adherent of bacterial pathology, to believe that any germ found in the saliva or elsewhere can have a causal relation to pneumonia after thirteen years of inactivity. When pneumonia is accepted as a disease dependent upon any or several germs, it must be accepted at the same time that such germs are more or less prevalent in the atmosphere at all times, and their genealogy need not be traced into the remote past.

In an article of some importance, Huchard³⁵ claims to have defined the condition which he calls "embryocardia," although he states that it was foreshadowed by Stokes when he spoke of the heart-sounds as having a foetal character.

He thus describes the condition: The heart-sounds are feeble, hurried, equal in intensity and pitch (timbre), resembling the tic-tac of a watch or the foetal heart-beats, so that the greater and lesser silences are alike, and cannot be distinguished. There is considerable diminution of arterial tension, with myocarditis oftener than not. It is the indication that makes the prognosis unfavorable, especially in typhoid, scarlatina, diphtheria, variola, and pneumonia. Usually it is associated with a condition of collapse and cyanosis. He asserts the efficacy of frequent subcutaneous injections of ergotine and caffeine. The condition is quite certainly associated with tachycardia, and usually terminates in death, although the above treatment may afford temporary relief.

As bearing upon the relation of tabes to cardiac diseases, Groedel³⁶ has examined one hundred and eight cases to ascertain how far the etiological connection, referred to in the ANNUAL of last year, is sustained. He found among this number only four cases of cardiac disease, and therefore concludes that the relation is purely accidental. The arguments heretofore advanced in support of a causal connection have not seemed to be sufficient to warrant the conclusions drawn, and in view of the above list of cases, it appears to us that those cases in which cardiac lesions can be traced directly to tabes must be exceedingly infrequent.

In Jacques Mayer's¹¹⁴ study of three hundred and eighty cases of diabetes mellitus the evidence is somewhat more direct, and his conclusion, that cardiac hypertrophy and secondary dilatation may be the direct result of the diabetes, seems justified by the facts and our own experience.

We are inclined to the belief, however, that the malnutrition consequent to the diabetic condition must very speedily induce cardiac degeneration, and the dilatation will follow close upon the hypertrophy in those cases where degeneration and dilatation are not the primary change. Our comments would be in the same vein regarding Bouveret's²¹¹ case of aortic insufficiency secondary to an interstitial nephritis. He describes three cases in which a diastolic murmur was recognized in the course of an interstitial nephritis. The case in which there was an autopsy did not show any valvular lesion adequate to produce the murmur, and he claims that the conditions in interstitial nephritis, and especially the high arterial tension, may cause such a dilatation of the orifice during life as to give a regurgitant current or a "relative aortic insufficiency, just as a relative mitral insufficiency is also a concomitant of interstitial nephritis."

Both the aortic and mitral insufficiency appear to us as more probably depending on dilatation of the orifices in connection with a general cardiac dilatation. Because the dilatation secondary to hypertrophy does not always involve the valvular openings of the heart, it is not impossible or improbable that degenerative dilatation which is primary or even secondary may not affect any one of these openings sufficiently to allow leakage, even when the physical signs do not show marked increase in the area of cardiac dullness.

Brenner⁸⁴ has presented an interesting observation concerning the effects of ascites (intra-abdominal pressure) upon the cardiac action. He states that, in a patient suffering from ascites whose sphygmographic tracings were strongly dicrotic and showed marked irregularity of the pulse, after tapping, which was twice repeated, the pulse became regular and quiet, and the dicrotic wave entirely disappeared. This bears an important relation to the report previously given in this article concerning the effects of abdominal tumors in producing cardiac degeneration.

GENERAL THERAPEUTICS OF HEART-DISEASE.

Among the more important papers in this branch are the contributions of Germain Sée and Gley³⁵ of the results of original research and experimentation upon both cold- and warm-blooded animals. We give a summary of their results in the use of *strophanthus*.

Respiration.—This was first accelerated, and then slowed and by a toxic dose arrested.

The Heart.—The dose employed for rabbits was one milligramme (one sixty-fourth grain), and up to four milligrammes (one-sixteenth grain) for dogs. (Two and one-half milligrammes, one twenty-fifth grain, was a lethal dose for a dog weighing twenty-five pounds). The effects of the subcutaneous injection were:—

First period, slowing of the heart with considerable increase of blood pressure, followed sometimes by an acceleration of the heart for some instants.

Second period, ending with the arrest of the heart, marked irregularities—acceleration, alternating with more persistent slowing. Blood pressure always very high with a full pulse, less marked at the last. The authors presume that there is also an increase of the arterial tone and tension which determines the vaso-constriction that is one of the essential features of the action of strophanthus. The nephograph showed a diminution of volume of the kidneys from constriction of their vessels. The destruction of the bulb and enervation of an extremity diminished the results as manifested in the arteries, but the lessened action was, however, of the same character, whence it is concluded that the poison acts on the intrinsic ganglia of the muscular coats of the arteries or directly on the smooth fibre.

Action on the Renal Secretion.—One set of experiments showed diminished secretion and congested kidneys, another no appreciable difference. The two prominent points are the increase of energy of the systole (during a certain period of the action of strophanthus); and elevation of intra-arterial pressure with full pulse. This combination is rare, since, usually, when intra-arterial pressure is high, the amplitude of the pulsations is diminished.

Comparison with Spartein.—Inferior to spartein, inasmuch as it is more toxic, and the latter does not increase blood pressure to anything like the same degree.

With Digitalis.—Its power of increasing the functional activity of the heart is greater than that of digitalis, but those observers have been mistaken who have supposed that it does this without increase of arterial tension.

Therapeutic Employment.—The results obtained by the authors were most favorable in mitral stenosis, less so in aortic insufficiency.

The sphygmograph showed immediate augmentation of pulse, and irregularities disappeared, though not constantly. Such were the results at times when the heart had lost its power, that compensation had ceased, and when there was pulmonary stasis and venous stasis with œdema. But in no case was dyspnœa relieved, nor was there any diuresis or relief of the œdema. Similar results were in dilatations and fibroid hypertrophies from generalized arterio-sclerosis. In anginas and painful affections it aggravated the trouble. It had bad action on stomach or cerebrum (occasional vertigo).

Dose.—One to one and three-fifths milligrammes (one sixty-fourth to one-fortieth grain) was employed.

Rosenbusch,^{4, 13} has also reported the results of his observations in the use of strophanthus. They do not appear to differ materially from the writers just quoted. He groups them as follows: 1. Strophanthus increases the force of systole and prolongs it somewhat; increases arterial tension, and slows the heart's action. 2. It strengthens the cardiac muscle and regulates its energy. 3. It is diuretic in heart affections, but its diuretic action in kidney affections is very slight. 4. It does not interfere with digestion, as digitalis does. 5. It can be continued for several weeks without cumulative toxic effects. 6. It may be used as a less decisive agent when digitalis is not yet fully indicated. 7. It is useful to keep up an effect already obtained by digitalis. 8. It is useless in aortic stenosis.

Eichhorst, of Zürich,¹³ gives a summary of his experience and opinions regarding strophanthus and its merits compared with digitalis, caffeine, spartein, adonis vernalis, and convallaria majalis. He affirms that digitalis is the surest of cardiac therapeutic agents, and that its cumulative action is exaggerated, so that the effect is often missed on that account. It may be given for weeks or months together. He recommends the combination of alcohol with digitalis when the cardiac weakness is very marked.

Strophanthus is said to come next to digitalis, and, having no cumulative action, its long-continued use has proved effective. Also in Basedow's disease it has proved especially useful. Eichhorst affirms very positively the diuretic action of strophanthus, which is denied by many.

In a comparative way he places the various heart tonics

about as follows: 1. Digitalis and strophanthus both control the heart in the same manner, slowing, regulating, and toning up its activity, and thus under certain circumstances increasing diuresis. 2. Digitalis acts more rapidly and on the whole with more certainty than strophanthus. 3. Strophanthus is superior to digitalis in that it does not develop cumulative effects. After six weeks' use its favorable effect upon cardiac contraction was shown by sphygmographic tracings. In some cases it acted more favorably than digitalis. 4. Spartein sulphate has only a weak and unimportant action on the heart, and exerts no influence upon the renal functions. 5. Caffein has still less action on the heart than spartein, but is an excellent diuretic. 6. Adonis and convallaria are unreliable in their effect upon the heart and kidneys, and in addition often cause nausea and vomiting. In connection with these clinical observations, reference may be made to the pharmacological and chemical researches of Catillon, Blondel, Bardet, and Adrian, who have shown that the strophanthus found in the market differs very widely in the proportion of strophanthin contained in different specimens. In ten varieties examined by Catillon the proportion of strophanthin varied from two to fifty per mille. It is very probable that the divergent results obtained by different clinicians are due to the uncertainty of composition as shown by the researches mentioned.

Eichhorst indorses the Oertel cure as regards the importance of regulating the ingestion and output of fluids and the good results obtained in fatty heart.

The use of the more recent cardiac tonics has been largely confined to cases of valvular disease or chronic conditions resulting in cardiac failure.

Graetz,¹³ however, reports his results in the use of strophanthus in acute cardiac failure. His observations cover a large number of cases and include fifteen of acute pneumonia, with the following results: 1. Respiration was slowed and made easier. (Directly the opposite, it is to be noted, to results on dyspnoea reported in the article by Germain Séc.) 2. In every case the pulse became fuller and slower and its irregularity disappeared. 3. No unfavorable effects whatever were noted.

For the other cardio-vascular drugs, Fussell,¹⁹ reports excellent results in some cases of pulmonary œdema, resulting from

heart failure, following hypodermic injections of nitro-glycerine, acting thus more upon the vascular than the cardiac element of the circulation. Thomson⁵⁰ advocates the combination of the three drugs, digitalis, strophanthus, and nitro-glycerine, in cardiac cases where their individual action is indicated, especially in obstructive diseases of the heart, and when the hypertrophy of arterio-sclerosis is beginning to fail. Personal reports of the results obtained in Bellevue Hospital from this combination are most favorable.

Huchard³ claims that in certain conditions of asystole, caffein, given hypodermically, is one of the most efficient heart tonics, by reason of the rapidity of its action. He states that it is useful in all the adynamic states in which the cardiac muscle is not sufficiently resistant, and that it is diuretic as well as tonic, but contra-indicated when there is hyperarterial tension. De Gempt also advocates caffein in collapse, especially of pneumonia, and Notlnagel advises its use alternating with digitalis.

Oertel's treatment of chronic cardiac disease still continues to excite much attention.

Hausmann⁶⁹ presents in a carefully considered article the results of his own experience and considerations.

He believes that this method of treatment is of great service in the therapy of disordered circulation, in weakening of the cardiac muscle, fatty heart, inadequate compensation in valvular diseases and their consequences. He says that the different factors in the treatment—withdrawal of fluids and mountain climbing—must be regulated in quantity and modified according to circumstances with the utmost circumspection. The author's conclusions are based upon a number of cases that emphatically indorse the Oertel methods. The following are the rules that he lays down for guidance :—

Mountain climbing is contra-indicated for the overworked heart, valvular disease with muscle weakness or in uncompensated conditions after endocarditis, sequelæ of typhus, arterial sclerosis, etc. He adduces the experience gained in the application of the milk cure. Whenever a great quantity of milk was taken daily the urine became diminished, therefore the following rule was evolved : to keep the quantity of milk taken short of the quantity of urine.

Lépine³ on the other hand, takes a less favorable view of this method. In a review of Oertel's method, that shows it little

favor, he refers to his own researches and those of Bamberger, which demonstrated that the quantities of hæmoglobin is somewhat increased in those suffering from cardiac disease. To Oertel's reply that there may be inspissation due to local causes in blood taken from the fingers, he allows some weight, but alludes to Lichtheim's results, showing how an absolutely rigid abstention from liquids produced little change in the blood (3 per cent.). He points out how imminent is dilatation as a result of the gymnastic or mountain-climbing treatment in every case in which the heart fails to empty itself well.

Again, Lichtheim, ³_{Apr. 18} in discussing the Oertel cure, denies the existence of a serous plethora due to excessive ingestion of liquids, and affirms that the oscillations in the quantity of blood due to alimentary *régime* are of no importance. He says that the mountain climbing, by increasing the flow of blood to the heart, is of advantage, but only when the heart is healthy and within certain limits. With diseased hearts it induces the very combination that leads to dilatation—weakening of the walls with increase of the intracardiac pressure. Such exercise is advantageous when it is habitual, not, as Oertel says, through some hypothetical dilatation of the arterial system, but because less carbon dioxide is produced by muscular exercise after it has become habitual. He says that the favorable results have chiefly been confined to the class of patients who eat too much and take no exercise. At the same time there is danger in the too sudden removal of the fat about the heart. When compensation is impaired there is danger in the dietary of Oertel as well as in the exercise prescribed. When the cardiac affection is due to overwork the method is good as long as there is no dyspnœa. Whenever compensation is disturbed it is bad.

Among English authors, Barr,¹⁸⁷_{July} in a long discussion of this treatment, upholds the treatment in general. He places the three essential elements as (1) decrease of water consumed; (2) increase of water excreted; (3) mountain climbing for reduction of fat and increase of heart power.

His conclusion seems to be quite general that this method is applicable only when the heart muscle is healthy, and is therefore of special value in cases of fatty infiltration and overgrowth, rather than conditions of true fatty degeneration.

We expressed last year our own opinion upon this point, and

need only repeat that we consider the applicability of this treatment extremely limited.

Högerstedt¹¹⁴_{M.I.C.H.1.2} has presented at least an interesting question in his article upon an exclusive milk diet in cardiac disease. He asserts that the absolute milk diet is a therapeutic method which, when compensation fails, can renew the heart's energy and stimulate blood production so as to be invaluable in hopeless cases. The nature of its therapeutic action is of a more or less indefinite character; still he makes good his position by the "curves" of cases in which the patient was put on three different diets for intervals that alternated with each other: (1) absolute milk diet; (2) partial milk diet; (3) ordinary diet. The results were as follow:—

1. *With the Absolute or Restricted Milk Diet.*—(a) Diuresis was always increased and remained high; (b) albuminuria quickly disappeared; (c) pulse fell to normal and under; (d) stasis disappeared; (e) general condition improved.

2. *With the Partial Milk Diet.*—(a) Diuresis decreased; (b) albuminuria increased; (c) pulse increased in frequency; (d) stasis increased; (e) general condition worse.

3. *With Full Ordinary Diet.*—(a) Diuresis very limited; (b) albuminuria constant and abundant; (c) rapid pulse; (d) stasis became considerable; (e) general state bad.

In this connection the note of Grassmann¹¹⁴_{M.I.C.H.3} may be of interest. As the result of a long series of experiments, he concludes that the absorption of albuminoids is not appreciably impaired in cardiac disease, while that of fats is considerably diminished.

Rosenbusch⁴_{No. 30} states the results of his experience lead him to advise the subcutaneous injection of a solution of common salt in the following cardiac conditions: 1. Sudden collapse, twenty to thirty grammes (five to eight drachms) of the 6 per cent. solution. 2. Heart-muscle weakness as the result of acute disease, twenty to thirty grammes (five to eight drachms), and then five grammes (seventy-five grains) of the solution daily. 3. Acute gastroenteritis, and any weakened condition after much vomiting or diarrhœa. 4. After pulmonary, gastric, or intestinal hæmorrhages, twenty to forty grammes (five to ten drachms), and then five grammes (seventy-seven grains) daily. 5. Heart weakness after chronic affections or cachexias, five to ten grammes (seventy-seven to one hundred and fifty grains) daily for a long time.

Cardiocentesis has received but little support during the past year. Most authors agree that its dangers outweigh its advantages in all except the most extreme cases. A few, however, take the opposite ground, claiming that it may be done with comparative safety. Among these Bruhl⁷³_{Dec. 17, '97} deprecates the rejection of this operative measure as too dangerous, and demonstrates that it has been practiced with safety. The puncture should be made in the third intercostal space close to the sternum for the auricle; the aspirating needle must take a course that is exactly antero-posterior. For the right ventricle the puncture should be on the fourth intercostal space close to the left border of the sternum. He affirms that the puncture of the right ventricle is a real letting of blood from the lesser circulation, and gives more relief than that of the right auricle. The therapeutic action is due (1) to the blood-letting, (2) to the mechanical excitation of the heart. He believes that it is destined to be of service in cases of dilatation of the right heart without organic lesion.

GENERAL POINTS AND CONSIDERATIONS.

Location of the Apex Beat and Cardiac Percussion Areas in Childhood.—Von Stark,³¹⁹_{Aug. '95} after a diligent comparison of various authorities, gives the results obtained by himself in examining the three hundred healthy and well-formed children varying in age from one month to fifteen years, and thus summarizes his conclusions: 1. In the first year of life it is very difficult to definitely locate the seat of the apex beat. 2. Till the fourth year it is outside the line of the nipple—one and a half to two centimetres beyond up to three years, and growing less and less. After four this is rarer and rarer, and is never the case after thirteen. 3. The apex beat is seldom on the line of the nipple during the first year; oftener it falls there up to seven, thence onward more rarely, but up to fourteen is occasionally met with there. 4. It falls inside the nipple line never before the second year, up to seven seldom, after nine generally, from thirteen almost invariably. 5. The apex beat is almost invariably found in the fourth intercostal space in the first year, then less and less seldom. 6. In the fourth to fifth spaces seldom during first two years, from three to six frequently, afterward more rarely. 7. In the fifth space very seldom during first two years, in the next years more frequently, after seven

generally, from thirteen almost invariably. 8. It is very seldom found in the sixth intercostal space at any time during childhood.

As regards the percussion areas, in his examinations of five hundred children he found his conclusions to be most in harmony with those of Weil among former authorities. But, with regard to young children, he found von Sahli most correct, and for children over six, Rauchfuss.

Riess, of Berlin,¹¹⁴_{M.I.H.} in a paper on the areas of cardiac percussion in adults, alludes to the greater importance that attaches to the diagnosis of a moderate hypertrophy than to that of a very marked one. He attributes the general uncertainty that prevails among practitioners as to the normal area of dullness to the contradictions between various text-books and authorities. He combats the statements of Rosenstein, Guttmann, etc., that it suffices for practical purposes to define the area of superficial dullness (absolute), and asserts that the superficial dullness helps the judgment very little in cases of cardiac hypertrophy; that there may be considerable hypertrophy with no increase of the superficial dullness, and no hypertrophy with increased dullness.

Again, he affirms that of those who attach suitable importance to the area of deep dullness, some, as Bamberger and Gerhard, exaggerate it by saying that, on account of the ever-increasing thickness of the covering lung, it cannot be accurately defined; others, as Freidreich and Weil, so limit the area of deep dullness that it affords no exact results with regard to the size of the heart. Others modify the method. Ewald combines auscultation with percussion, Ebstein palpation and percussion; others recommend direct palpation. Also there are those who recognize three circles.

The author claims to have recognized the exact outline of the heart, and to have verified it repeatedly at the autopsy, with only an occasional error of one centimetre, chiefly at the right border; and for this he requires no special method of percussion, nor even the employment of palpation. He uses finger or hammer—if the latter, a light one with short handle, held short.

In spite of the vibrations due to the sternum one can learn to allow for them and to differentiate the limit of deep dullness by percutting quite perpendicularly and going downward, and it is generally found to be easy; yet some are apt to be deceived, and

locate the right boundary at the middle line. Cases of emphysema and the like make it more difficult to fix the limit of deep dullness. What the author has fixed on as the normal area of deep-seated dullness corresponds nearly to the larger area of most authors and to Ebstein's area of "cardiac resistance." It begins at the level of the second intercostal space or third rib, passes to the known convex line and down to the apex; to the right it goes beyond the sternum as a curved line, slightly distant from the sternal border in the third intercostal space, most so in the fourth, and slightly in the fifth. On an average the maximum is one and a half to two centimetres to the right of sternal border. He deems it useless to define the lower border.

Of the uncertain lines that are commonly employed for denoting these areas, he uses the middle line of the sternum only, and decides the question as to hypertrophy by measuring from this middle line to the limits of dullness.

The average obtained from a series of two hundred observations establishing the normal area of deep or relative dullness is as follows:—

Distance from sternal notch to the upper limit of dullness, seven centimetres.

Distance from middle line to the *right* limit of the area, in third intercostal space, 2.83 centimetres; in fourth intercostal space, 3.61 centimetres.

Distance from middle line to *left* limit of the area, in third intercostal space, 4.84 centimetres; in fourth intercostal space, 7.44 centimetres.

The author illustrates the importance of these data by a case in which he was enabled to make correct diagnosis of a small aneurism of the descending aorta solely by data thus obtained.

The Cardiac Pulsation—Its Forms, Both Normal and Pathological.—Martins⁶⁹ states that two cardinal points have entered into the three explanations hitherto offered of the apex beat of the heart. The first concerns the change of form in the heart at the systole and consequent advance of the apex; the second insists on the forward, downward, and leftward movement of the heart as a whole, due to recoil, and claims that this, rather than a change of form, is the cause of the apex impulse.

The author claims that a more exact study of the heart's

movements and the periods represented by them has sufficed to refute these theories. By proving that the heart's forward movement or apex beat is over before the flow of blood into the great vessels begins, he renders objectless the application of the recoil principle as a motive force. The new method of employing the cardiograph consists in combining with the record notations of the closing and opening of the valves recognized by the sounds. Thus in the normal cardiogram the closing of the auriculo-ventricular valves and the opening of the semilunar valves mark respectively the beginning and end—the bottom and top—of the ascending stroke, and this is called the closed portion of the systole, while the line of descent represents the outpour period of the systole. That the summit of the ascending stroke represents the opening of the semilunar valves he was enabled to demonstrate by juxtaposition with the curve representing an aneurismal pulsation in a case of aneurism of the ascending portion. Here the beginning of the aneurismal pulsation followed immediately upon the opening of the semilunar valves, for they were intact and immediately below the aneurism.

From this first portion of the new reading of the cardiogram, it follows that at the instant when the outpour of blood takes place at the aortic orifice, the forward movement of the whole heart, which is the apex beat, has already taken place. Thus, the phases of the heart's movement that are associated with the upward stroke of the cardiogram can alone be responsible for the apex beat. They comprise the period when both valves are closed and when, therefore, the intraventricular pressure is raised above that existing in the aorta, which is what causes the semilunar valves to open. The apex beat becomes resolved into what may be called the preparatory portion of the systole.

The author then gives the following descriptions of some of the more common pathological cardiograms:—

Mitral Insufficiency.—This cardiogram differs in nothing from the normal. This is contrary to what one might expect, seeing that regurgitation must take place before there is sufficient pressure on the ventricle to spring the semilunar valves. This he attributes to the fact that the instrument is most frequently in contact with the chest-wall, where it corresponds to the right ventricle instead of the left, which for normal cardiograms is a matter of indifference,

the conditions of right and left ventricular action being the same.

Mitral Stenosis.—The tracing got by the author corresponds precisely with that of Landois—with two elevations representing a double second sound, the closing of pulmonary and aortic valves not being simultaneous, and each giving an elevation in the tracing corresponding to the valve closure.

Aortic Stenosis.—The difficult entry of the blood into the aorta is expressed by a stroke that continues to ascend instead of descending, thus connecting in this disease the pathological portion with the normal, and indicating that the lesion is but an exaggeration of the normal heart action, and the abnormal element in the cardiogram an increase of its most prominent normal part.

Aortic Insufficiency.—In a case of uncomplicated aortic insufficiency in the stage of full compensation, the systole begins with the closure of the auriculo-ventricular valves when the curve has almost reached its highest point of the preparatory period. The second sound, with the closure of the right semilunar valves, falls precisely at the lowest point of the curve. This is nearly the same as the normal. Here the stroke, marking what is called the closed period, survives in spite of the insufficiency. Although the valves are already open, the flow of blood does not begin immediately at the outside of the ventricular contraction. The ventricle is already exposed to aortic pressure, and this must be overcome as truly as though the valves were closed, before the outflow can begin, and this period is represented by the same stroke as in the normal. It is at this point that the change of form in the heart is produced, and the up stroke would be more marked but for the fact that the intercostal space has already been lifted during diastole, since the filling of the relaxed ventricle is accomplished while it is exposed to aortic pressure. The emptying of the ventricle is sudden and is marked by an equally sudden drop in the cardiogram.

Martins claims to have guarded against the errors possible through the delay that must occur in recording impressions of special sense and which necessitates the personal equation of astronomers. He also claims that these correct themselves in the case of rhythmic sequences. Byrom Bramwell and Milne Murray² confirm this, saying, "The absence of any psychical loss under such

conditions is a most important fact for the purposes of our present research."

The author also states that he made due deductions for the time difference between the apex beat and carotid pulsations, since the opening of the semilunar valves can only be timed accurately from the latter.

Wm. J. Mickle²_{Mar. 10} presents an elaborate discussion on the relations of insanity to cardiac disease. In brief, he reaches the conclusion that there is an etiological relation in both directions, and especially that disturbances of circulation such as may be induced by the various cardiac lesions is directly concerned in the development of many forms of insanity.

To one who has become weary of valve and ventricle, of treatment and tachycardia, of contradictory and dictatorial statements, we cannot suggest a more pleasing relief, and mental as well as cardiac tonic, than a perusal of Richardson's story³⁸_{Mar. 9} of the life and work of Laennec. It is written from the heart of a true physician, and will lead the reader not only to admire and seek to follow in the footsteps of the illustrious diagnostician, but to feel a strong glow of affection for the artist who has given us such a charming picture.

DISEASES OF THE STOMACH, LIVER, AND PANCREAS.

By EDWARD T. BRUEN, M.D.,
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DISEASES OF THE STOMACH.

DYSPEPSIA.

DURING the past year the *rôle* of chemistry in the clinical study of dyspepsia has been reviewed by many able writers, and, although but little information has been added, the work of the year 1887 has been undergoing careful scrutiny and revision. Congo red is still declared by Riegel to be a perfectly satisfactory preliminary test for the reaction of the gastric juice, but Boas prefers tropæolin paper. There is, however, considerable disagreement among authorities as to the most accurate means of determining the presence of free HCl. Günzburg³¹⁹ maintains that the usual color tests, namely, gentian violet, tropæolin, and Congo red, are affected by the organic acids, and Boas specifically states that a 0.03 per cent. lactic acid solution will cause a weak but distinct blue in Congo red paper. Arlt and Kuhn¹¹⁰⁰ argue that this is only true for a watery solution, but Boas replies that the objection is superfluous, as he only referred to free lactic acid.

Boas has had a tropæolin paper prepared which discriminates between HCl and lactic acid, and is declared to be highly satisfactory as to cheapness, simplicity, and distinctness of result. A percentage of HCl even below 0.05 is thus easily recognized, and the presence of even 5 per cent. of organic acids makes no difference. Moreover, the degree of coloration with HCl affords an indication of the quantity of the latter present.

The paramount value of Günzburg's test for HCl can be said to be sustained, viz.: thirty grains phloroglucine, fifteen grains vaniline, and one ounce of absolute alcohol. One drop of this solution in presence of a trace of a concentrated mineral acid takes on immediately a bright-red hue, while at the same time beautiful red crystals are deposited. In using this test it is best to filter the

contents of the stomach, and it is sufficiently delicate to indicate up to one-twentieth per milligramme of HCl, or a drop or two of the test solution may be added to a few drops of the unfiltered stomach contents on a strip of paper. On the application of heat the red spot indicating HCl appears; the test is not affected by ether. The organic acids, lactic and acetic acids, give only negative results in the presence of this reagent. If the proportion of mineral acid is very minute, it is necessary to slowly evaporate the liquid in a porcelain crucible and a deposit of fine red crystals around the edges will be obtained. For this purpose a spirit-lamp should be employed, and care taken that the liquid being tested does not boil.

When the gastric liquid contains considerable quantities of albuminates or peptones, the isolated crystals are not observed, but the bright coloring persists, and the crucible is covered with a mixture composed of albuminates and fragments of crystals.

Instead of commencing the test at the end of fifteen minutes and repeating it every quarter of an hour till four or five trials have been made, a procedure which is very trying to the person under examination, Dr. Sée practices the extraction of the juice at the end of forty-five or sixty minutes after a meal.

It is objected to this test that hippuric acid may be present in the stomach, and, at a temperature of one hundred and five to one hundred and eight degrees, will respond to Günzburg's test, while HCl reacts at seventy-five degrees.

This test is a delicate one, but not absolutely reliable, a view sustained by the experiments of Faucher, who made the test with eggs of various degrees of freshness, and, after having them boiled hard, took an equal weight of their whites and triturated them with a given weight of distilled water. He then tried the reagent (phloroglucine vanilla) upon the liquids separately. The new-laid egg showed no definite reaction; the egg five days old became rose-colored; three eggs of doubtful freshness gave an intense dark-red color; in short, the intensity of the reaction was in proportion to the age of the egg, which is explained by the increasing quantity of sulphuric acid. It has been proved also that a drop of sulphuretted hydrogen prepared by the help of well purified gas, phosphate of soda, and tribasic phosphate of lime also produced a red coloring. These experiments have been frequently repeated, and always with the same results. Faucher, therefore,

concludes that it is impossible to prove the presence of HCl in the products of digestion by the use of phloroglucine vanilla. The recognition of lactic acid may be effected by Uffleman's ¹¹⁴_{v. A. p. 322} test, using three drops of liquor ferri chloridi, three drops of concentrated solution of carbolic acid (4 per cent.), and twenty cubic centimetres of distilled water. It is necessary to prepare the test fluid fresh each time before using. The solution thus prepared has an amethyst-blue color. It becomes yellow in the presence of minute quantities of lactic acid, and by some it is said can even be decolorized by this acid.

Haas ³⁴_{Feb. 7} gives the following table of reaction with the acid : —

	Hydrochloric Acid.	Lactic Acid.
2 per cent	Colorless.	Greenish yellow.
1 "	Pale gray.	Greenish yellow.
$\frac{1}{2}$ "	Steel gray.	Straw yellow.
$\frac{1}{4}$ "	Dark gray.	Somewhat brighter.
$\frac{1}{8}$ "	Blue gray.	Light gold.

These reactions, according to Wurster, ²⁶⁵_{v. 1, Feb. 11, '97} will not obtain if free ammonia or ammoniacal salts be present. Bourget ¹⁹⁷_{Feb. 20} recommends that the acidity or alkalinity of the contents of the stomach be determined (1) by means of Congo red or litmus paper, (2) lactic acid by Uffleman's test, (3) recognition of hydrochloric acid by means of Günzburg's test, (4) butyric or other fatty acids by means of the odor of rancid butter or by phenic perchloride of iron, which gives an ash-gray color. If the juice be shaken with ether and the ethereal residue evaporated, acetic and butyric acids can be detected by the smell. On neutralizing the ethereal solution with sodic carbonate and adding the iron solution, acetic acid will turn it blood red. On adding distilled water, a drop or two, and a bit of calcic chloride, oil-drops of butyric acid will appear on the surface. To estimate the amount of hydrochloric acid in organic acids one should proceed as follows: First accepting the statement that the normal amount of free hydrochloric acid in the stomach during digestion may be between 0.22 and 0.28 per cent., to estimate the amount of HCl in a given amount of a solution (for example, fifty cubic centimetres), ascertain how many cubic centimetres of a standard alkaline solution are required to neutralize it. The

alkaline solution usually employed is a deci-normal solution of sodium hydrate. Each cubic centimetre of this contains .004 gramme of caustic soda, and will exactly neutralize .00364 gramme of absolute HCl. The test alkali is slowly added from a burette, with constant stirring, until a neutral reaction is obtained with litmus or any other suitable indicator. The number of cubic centimetres so used multiplied by .00364 gives the number of grammes of absolute HCl contained in the fifty cubic centimetres, from which the percentage can be readily calculated. Kinnicut,⁵⁸ however, writes that his experience leads him to believe that very frequently organic acids are present in the contents of the stomach in many of its derangements. In this case all methods for the quantitative determination of HCl without the previous elimination of the organic acids are quite worthless for correct conclusions.

From a very careful review of the work of many German observers in this field of investigation the conclusion has been forced upon him that the presence of organic acids is frequently disregarded by them. The quantitative estimation of HCl in such cases is necessarily, therefore, only one of the absolute acidity of the gastric contents. The only accurate method for the estimation of the percentage of HCl in solution with the organic acids, I am convinced, is that described by Cahn and v. Mering. The details of their method are as follow:—

1. A given quantity (for example, fifty cubic centimetres) of the gastric filtrate is carefully distilled in an ordinary distilling apparatus until it is evaporated down to ten cubic centimetres. By these means the filtrate is freed from the volatile organic acids (viz. : acetic, butyric, etc.).

2. The lactic acid is now abstracted from the concentrated residue by agitating it with a large volume of ether and removing the ethereal stratum. Several successive portions must be used to insure that all the lactic acid is taken up.

3. The amount of HCl in the sour, watery fluid remaining after the removal of the ether, and therefore in the original portion of gastric filtrate used, can now be ascertained by trituration as above described.

To estimate the amount, if desired, of lactic acid in the ethereal solution, evaporate the combined portions of ether, dilute the residue with a convenient quantity of distilled water, neutralize

as in the estimation of HCl, and multiply the number of cubic centimetres of the test alkali used by .009, to determine the number of grammes of absolute lactic acid in the residue.

The other ordinary color-tests for HCl are: methyl violet, which is turned blue with feeble solutions, green with stronger solutions, of the acid; thin solutions of red fuchsin are turned yellow; solutions of tropæolin are turned from red to brown. A strong solution of lactic acid may effect the same change in the above agents, hence the superiority of Günzberg's test. In opposition to this, Honigman and von Noorden¹¹⁴_{M.I.S., II.1} still claim, from experimental evidence, to show that the point when a reaction with methyl violet was reached was also the point when the juice attained a certain degree of digestive power; and they believe, although exception may occur, that the value of the color reaction in the recognition of free and active HCl is maintained in the majority of cases. F. Spaeth³⁴_{V.M., N.A.S.I} has devised a very simple apparatus for testing the presence or absence of HCl. He takes a small bullet, calibre No. 6, and wraps about it a silk thread, No. 1, which has been previously soaked in a 0.015 per cent. watery solution of Congo red. To this is fastened a small piece of elder-pith which has been soaked in blue litmus paper. The whole is attached to a long silk thread. The bullet and pith-ball are swallowed and allowed to remain in the stomach for a minute, then drawn up. Any acid present turns the litmus pith to red, while if free HCl is present it turns the Congo red thread blue.

Ewald's "test breakfast" consists of white bread, water, and weak tea. Albumen, sugar, starch, fat, salts, and extractives are very soon reduced to a fluid or semi-fluid condition, so that a portion can be readily withdrawn by a stomach-tube. In so far as acidity is concerned, the normal digestion of this test meal may be divided into three stages: ten or fifteen minutes it is acid—this reaction, which is continued about three-fourths of an hour, being due to lactic acid. Then begins a stage in which, together with lactic, hydrochloric acid may be detected. Finally the lactic acid disappears, and normally, after the lapse of an hour, only HCl is found. It has been supposed that the presence of an organic, especially lactic, acid in the stomach was always pathological, but late researches, especially those of Ewald and Boas, have shown that in the first stages of digestion an organic acid is always

present, but the presence of such acid in a later stage of the process is thought to be pathological.

The Influence of Moderate Exercise upon Digestion. — Dr. Cohn, ³⁰³_{v. 19, p. 19} in order to decide the question, "Is rest or exercise necessary to favor digestion?" made the following experiments in the laboratory of Professor Rossbach:—

He gave to a number of dogs scraped meat and water; after the lapse of a certain time the contents of the stomach were removed, the dogs having been submitted to exercise as well as to rest. With the dogs which had rested, digestion was at its highest one hour after the meal; the juices of the stomach were rich in HCl and pepsin and poor in lactic acid; at the end of two hours digestion was still further advanced; the quantity of HCl and peptones was considerable, only traces of lactic acid being found. At the end of six hours digestion was complete.

In the dogs which had been submitted to two hours' active exercise after their meal traces only of HCl and peptones were found, but large quantities of lactic acid. It was only after the lapse of five hours (the animals having rested for three hours) that digestion began again, marked by the presence of large quantities of HCl and peptones. At the end of six hours digestion was not yet completed. Ewald and Boas, ³⁴¹_{v. 26, No. 12} made the same experiments with the same results. HCl is a product of secretion, lactic acid one of fermentation; the slower the flow of the first, the slower digestion, and *vice versa*. The writers conclude that exercise after a meal retards digestion.

The time of digestion is not accurately known. It varies with the individual and with the character of the food taken. Leube, ³²⁶_{v. 31, No. 1, p. 73} has found, however, that normally, after a definite meal, all food has disappeared from the stomach at the end of seven hours. In a certain proportion of cases it may disappear before that time, but if, after seven hours, food is found in the stomach, it shows that the process of digestion is delayed. To test this, Leube orders a test breakfast of soup, a piece of beefsteak, and a slice of white bread, with water. At the end of seven hours the stomach is washed out, using about three funnels of water, and this water is examined for undigested fragments of food. In health it should contain no such fragments.

The test of the absorbent powers of the stomach is a simple

one. Penzoldt⁴ has found that by giving a small amount of iodide of potassium, 0.2 gramme (3 grains), in a gelatine capsule with a wineglassful of water at least three hours after a meal, or preferably on an empty stomach, the salt is absorbed, and can be detected in the saliva. The patient is directed to spit once a minute on a bit of starch paper, which is then touched with a drop of fuming nitric acid. In health, in from seven to fifteen minutes there is found first a reddening and then a bluing of the paper.

The test of the motor activity of the stomach is equally simple. Ewald has lately found that salol is changed in an alkaline solution to salicylic acid. The acid gastric juice has no effect on it, but when it passes through the stomach it is changed to salicylic acid by the alkaline pancreatic juice, absorbed, and eliminated by the urine. The patient is given three to five grains of salol, and specimens of the urine obtained every fifteen minutes or half hour. The addition of a drop of tincture of the chloride of iron to the urine will, when it contains salicylic acid, give a deep brownish-red color. This color is said to be found in from half an hour to an hour after taking salol. If it does not appear until after that time the motor activity of the stomach is regarded as below normal. Later observers make the time rather longer.

With ordinary meat diet lactic acid is formed in from ten to thirty minutes, not secreted by the gastric glands, but formed from the meat itself. This form of lactic acid or sarcolactic acid disappears at the end of two hours, under the action, probably, of the hydrochloric acid of the gastric juice, which becomes strong enough to prevent fermentation. In disease, where abnormal processes of fermentation are going on, we may get another form of lactic acid, paralactic acid, isomerically the same, except that it polarizes to the left instead of to the right.

Organic acids are always present in the healthy stomach, and appear to increase with digestion, but they are never present in considerable quantity.

In order to wash out the stomach, Leube recommends a tube of eleven millimetres diameter with a calibre of seven millimetres, but a smaller one will answer. The patient should sit erect, the head thrown a little back, the mouth well open, and the tongue depressed and pulled forward a little by a spatula or the left

index finger. The tube is then passed into the fauces, past the epiglottis, and into the pharynx. Once engaged in the œsophagus, there is no further trouble, except that it may stick for a moment at the cardiac orifice. If it does, a little water poured into the tube will overcome this obstacle. If the patient begins to retch or to show signs of suffocation, he should be told to take deep breaths. It is rarely necessary to withdraw the tube. When the tube reaches the stomach it generally happens, unless the stomach be quite empty, that we hear a bubble or two of air come up the tube. Milk is a good material to lubricate the tube and facilitate the introduction, being much less nauseating than vaseline or oil. To wash out the stomach, a piece of rubber tubing is connected with the stomach-tube, with a funnel at the end, and about a pint of warm water is slowly poured into the funnel, holding the funnel end well up. By suddenly lowering the funnel the contents of the stomach may thus be siphoned out. In withdrawing the tube, care must be taken to compress the end tightly before withdrawal, so that the contents of the tube may not drop into the larynx.

But in order to obtain the best results for the examination of the gastric juice, it is advisable to obtain it undiluted by Riegel's method. About three hours after a meal, having passed the tube, a certain part of the contents of the stomach may be pressed out by external pressure over the abdomen or a voluntary effort on the part of the patient. The stomach-pump or aspirator can be attached to the tube, and the contents after filtering are ready for the test. To ascertain the digestive power of the stomach a bit of egg-albumen is put into a test-tube containing ten to twenty cubic centimetres of the juice, and kept at the temperature of the body. For this purpose, it is well always to take a piece of the same size. Sticker⁴¹_{Feb. 26, '97} advises a disk eight millimetres across and one and one-half millimetres thick. If the juice be undiluted, this should be digested in from two to three hours. With diluted juice, the time, of course, will vary. If juice enough be obtained, it is well to perform control experiments at the same time by taking three test-tubes and leaving one untouched, adding a drop of dilute hydrochloric acid to the second and a flake of pepsin to the third.

To facilitate the percussion of the stomach, Penzoldt¹¹⁰¹₁₈₇₅ had the patient take considerable water and thus mapped out the lower

border of the stomach by detecting the dullness. Küssmaul inflates the stomach by generating gas within it by giving two grains of bicarbonate of soda and one and one-half grains of tartaric acid. The gas thus generated distends the stomach so that it can be very accurately bounded. In cases in which hypersecretion of gastric juice is suspected the stomach should be carefully washed out, preferably in the evening, and the patient should be compelled to fast until the following morning, when the stomach-tube is again introduced.

The results of this accurate study of the gastric secretions may be summed up as follows: The constant presence of free hydrochloric acid is the strongest possible proof of the absence of cancerous disease. The absence of hydrochloric acid from the gastric secretion is noted not only in cancer, but also in several other diseases, such as atrophy of the gastric follicles and amyloid degeneration of the organ. Carcinoma does not exert any mystical influence upon the production of HCl, but simply is often accompanied by inflammation or atrophy of the gastric tubules—a condition prone to occur as the last stage of a chronic gastritis.

A case of atrophy of the mucous coat of the stomach is reported by Litten and Rosengart,¹¹⁴ occurring in a young girl of eighteen, of healthy parentage. There was entire absence of hydrochloric acid reaction, with diminution of motor power of the stomach. The stomach, however, was not enlarged; indeed, after distention (with CO₂) seemed lessened. Similar cases have been reported by Fenwick, Ewald, and Kinnicut. HCl is notably reduced in mucous dyspepsias, especially those forms associated with marasmus. In febrile disorders true acid gastric juice is not wanting, but is greatly reduced, not only in the hydrochloric acid, but also in the pepsin. In tuberculous, diabetic, and uræmic dyspepsias the HCl is also much reduced.

When the HCl is increased the symptoms are thirst, heart-burn, pain at night, and acid vomiting. Increased acidity of the gastric juice is a possible cause of gastric ulcer, the extreme acidity of the juice rendering self-digestion easier. In this form of dyspepsia the organic and volatile acids are more or less completely wanting, and the digestion of proteinaceous matters is well accomplished; it is even probable, considering the rapidity of peptonization, that the presence of peptones in excess hinders the rest of

digestion. The digestion of starchy food is, however, impeded; for with more than one-tenth of 1 per cent. of HCl in the gastric juice maltose ceases to be formed. If, in fact, we give to these patients an amylaceous mixture, and examine after an hour the filtered liquid from the stomach, we find plain evidence of incomplete saccharification; a solution of iodide reveals the presence of erythro-dextrine, while in the normal state we ought to find achro-dextrine, or even maltose. In severe forms of dyspepsia there may be permanent hydrochloric hypersecretion, so that in the morning when the stomach is empty one can obtain by aspiration several drachms of liquid containing HCl in abundance and capable of digesting albumen. This condition has been described by Reichman,⁴ No. 12, 16, 27; Jaworski,³⁴ No. 7, 27; and Riegel,¹¹⁴ No. 12, 13, 15, who found in four cases a marked dilatation of the stomach, resulting, doubtless, from prolongation of the digestive processes.

In still another type of dyspepsia the secretion of gastric juice is variable as to the amount of HCl present. This condition is especially associated with dilatation of the stomach.

Dilatation of the Stomach.—Dilatation of the stomach may be brought about by fibrous or cancerous disease of the pylorus, by atony of the muscles as part of a general process of relaxation throughout the muscular system, or through atony of the intestines and intestinal indigestion with regurgitation of gas from the intestines into the stomach.

The process of dilatation is commonly preceded by hypertrophy of the muscle, and Ewald divides cases of dilatation into two groups: (1) those caused by mechanical obstruction of the pylorus, as in malignant disease, fibrous thickening, with or without ulcer; (2) those due to asthenia or akinesia of the stomach, a condition liable to arise in the course of anæmia, various neuroses, exhausting acute or chronic diseases. In this connection it must be remembered that in man the position of the pylorus, owing to his erect position, favors dilatation.

In addition to these causes dilatation may arise from pressure on the pylorus by a tumor outside the stomach, from ingestion of an excessive amount of coarse food, from direct lesions of the walls of the stomach in portal congestions and in Bright's disease, from adhesion of the stomach-walls to other tissues, or, lastly, in connection with chronic catarrh of the stomach.

Care must be taken to avoid confusing dilatation of the stomach with that of the transverse colon. Ehrlich's salol test is here applicable to determine dilatation and retardation of the muscular activity of the walls of the stomach.

Finally, Johnson,³⁷⁰ Boas,¹¹⁴ and Klemperer¹¹⁴ have each contributed a paper on the rennet ferment in the human subject. It is generally absent in the same class of cases in which HCl is absent, but the presence of larger or smaller quantities of HCl has no influence on the quickness or completeness of the coagulation produced by rennet. The ferment is easily destroyed by alkalis, and probably is destroyed by the pancreatic juice, and, as their experiments show, is not found in the fæces. In two cases of fever they found both rennet and HCl absent.

Boas points out a way of distinguishing whether the coagulation is brought about by the acid or the rennet of gastric juice added to milk. When dilute HCl is added to milk and the coagulum and whey thrown on a filter, the filtrate is unable to produce coagulation in a fresh portion of milk; on the contrary, when the coagulum produced by rennet is treated in the same way the resulting filtrate acts freely on milk, because a portion only of the ferment has been used, the remainder passing with the serum through the filter. He found that in the healthy stomach the secretion of the three constituents of gastric juice, pepsin, acid, and rennet go on simultaneously, *i.e.*, when shortly after food no acid has been produced rennet was also absent.

Klemperer found that rennet ferment was present in all cases of stomach disease, including cancer, when HCl was present, and when HCl was not present it was occasionally observed in the presence of lactic acid, which has a similar action in developing the ferment from its enzyme. He thinks testing for the presence of the ferment can lead to no diagnostic conclusion, since without hydrochloric acid be present it is usually not developed. He has also made some interesting observations in connection with the use of alkalis, particularly lime-water.

In certain cases of chronic catarrh milk is vomited in an uncoagulated condition, and in these cases he found great benefit from mixing the milk with lime-water. The milk was not vomited, and on washing out showed that it was clotted in the stomach. The quantity of lime-water added was two tablespoonfuls to one

half-litre of milk. The quantity is in this case of great importance, in view of the frequent use of lime-water as an addition to milk to prevent coagulation. There can be no doubt that if a sufficiency of lime-water be added to render the milk distinctly alkaline, rennet ferment will not cause coagulation, and, what is more, the contact of the rennet with the alkali permanently destroys it, in part at least, so that subsequent acidification does not restore its properties. One third of lime-water at least is required for this purpose.

In conclusion, it is necessary to refer to some observations which show that micro-organisms may subserve some useful purpose in the economy, and suggest that by taking advantage of their opposing tendencies we may compel these germs of fermentation and putrefaction to play the rôle of digestants and antiseptics. Rietsch³⁵⁹_{July, '07} has demonstrated the digestive capacity of the cholera bacillus, staphylococcus aureus, which in neutral solution digested fibrine and the resulting fluid gave the reaction of peptone. Hirschler³⁶⁶_{Oct. 27, N. I. J. '07} found that in mixtures of albuminoids and carbohydrates the bacteria which first develop are invariably those which decompose the latter. For example, in milk, notwithstanding the presence of numerous casein-decomposing bacteria, the acid fermentation first sets in. In such cases the withdrawal of carbohydrates and the substitution of a purely albuminoid diet is indicated. On the other hand, in cases of putrefaction of albuminoids, with offensive stools, all proteids are to be temporarily withdrawn and carbohydrates substituted. The acid fermentation of the latter is the result of bacteria which are inimical to those causing the horribly offensive stools. A well-regulated diet may come to mean one selected not exclusively with reference to the nice adjustment of its proteids and carbohydrates, but also with a view to the mutual relations of the minute organisms which subsequently develop within it.

Treatment of Dyspepsia.—When acid is in excess, the stomach should be washed out at night and Carlsbad salt or at least laxatives taken in the morning. The diet should be albuminous, avoiding carbohydrates. If there is lactic acid from fermentation the stomach should be washed out at night and hydrochloric acid given, for the latter checks the formation of lactic acid. When the hydrochloric acid is diminished or absent the dose of five or ten minims

is too small; thirty to forty-five minims (2 to 3 grammes) should be given in three doses fifteen minutes apart, beginning about an hour after a meal.

The actions of bitter medicines on digestion has been considered by Reichman.¹¹⁴ His investigations were limited to the human stomach. In his tests he employed gentian, quassia, and wormwood. Cold infusions (twelve parts to two hundred) of these bitters were given without food and before or during a test meal of distilled water and albumen. The result showed that after the administration of these bitters, which all act alike, the secreting power of the stomach is less than after the taking of distilled water. But when the drug is eliminated from the stomach the secretory apparatus is excited to increased activity. If food and the infusion were swallowed at the same time both the secretory and the motor function of the stomach were impaired.

Of course, the practical lesson to be learned from this is that bitters should be used only in cases in which the gastric juice is diminished, and that they must be taken about half an hour before food.

Salt has been thought by many to promote secretion of HCl, and was therefore useful in certain cases, any excess of acid formed being neutralized by the bile acids in the small intestine. Reichmann,²⁷³ however, observed that by giving salt when the stomach was empty and before and after the test meal he was able to determine that, so far from increasing the secretion of gastric juice, it actually hinders it. The diminution of the acidity of the gastric juice, as was always proved after the introduction of sodium chloride, arises chiefly through transudation from the vessels of the mucous membrane, which is irritated by the salt, but the transudate is alkaline and neutralizes the hydrochloric acid.

Dietetics—Amylaceous Regimen.—In mucous dyspepsias, and even in cancer, where hydrochloric acid is totally lacking, it is useless and often dangerous to deprive the patient of food principles contained in the starches, and especially of such dietetic substances as are both amylaceous and nitrogenized. In conditions in which hydrochloric acid is in minimum proportion, the amycolytic period of digestion is predominant and rapid, and considerable absorbable maltose is formed with facility. In such cases, soups with rice, etc., may be permitted, and also bread and

biscuit; fat should be given in sparing quantity or withheld altogether; sometimes potatoes roasted in the ashes, pea-soup or porridge may be given.

Meat Regimen.—A diet of starchy food should be rigorously interdicted in dyspepsias with hypersecretion of HCl. Such articles of food are not transformed by the gastric juice; the excess of acid may determine spasm of the pylorus and retention of the amylaceous substances in the stomach, or exaggerated contractions of the muscles of the stomach, causing premature expulsion of the incompletely transformed or fermenting aliments. Fresh meat and fish are indicated in these cases, and the patient should virtually live on this diet—beef, mutton, fish, and lean ham, in preference to fowl, game, or veal. As for beverages in dyspepsias, those with hyperacidity are the worse for wine, and, while fermented liquors are to be avoided, whisky and brandy in moderation seem to do no harm, except to occasion a slight retardation of the digestion.

Dujardin-Beaumetz^{108 Nov. 1} suggests three rather more liberal plans of diet, distinguishing these conditions:—

1. Dyspepsia due to oversecretion of gastric juice, diet to be purely vegetable, consisting of eggs, farinaceous preparations, and fruit. (a) The eggs to be soft-boiled, especially the yolk. (b) Farinaceous foods, to be taken in the form of soups—as potato, turnip, lentil, Indian, wheat, chestnut, oatmeal, barley, and macaroni soups—all these, of course, to be rendered as thin as possible. (c) Vegetables to be thoroughly cooked and to be taken in the form of vegetable soups, or soup made of small peas, all to be well boiled; the same holds good for spinach and turnips. (d) All fruits, avoiding raisins, should be used in the form of jelly. (e) The bread should be well baked, or toasted. (f) Drinks—wine mixed with water, light beer or milk, mixed with alkaline waters.

2. Dyspepsia due to deficient secretion of the gastric juice—peptonized substances, toasted bread, bouillon, mixtures of broths and milk, powdered meats, scraped meats, pepsin, lemonade, with hydrochloric acid:—

R Hydrochloric acid,	.	.	.	.	33 (11.7 grammes).
Water,	.	.	.	.	0 1 ($\frac{1}{4}$ litre).

One glass after each meal.

3. Dyspepsia due to sympathetic troubles, diet to be purely vegetable.

NEUROSES OF THE STOMACH.

Sympathetic or nervous dyspepsia is that form in which there is digestive disturbance, but in which the stomach digests a test breakfast in seven hours, and the gastric juice is normal. Sir



ANOREXIA NERVOSA. (*Lancet*.)



SAME CASE OF ANOREXIA NERVOSA
AFTER RECOVERY. (*Lancet*.)

William Gull⁶_{Mar. 31} has described a case of this affection under the title "Anorexia Nervosa":—

Miss K. R., aged fourteen, the third child in a family of six, one of whom died in infancy; father died, aged sixty-eight, of pneumonic phthisis; mother living and in good health; has a sister the subject of various nervous symptoms and a nephew epileptic. With these exceptions there have been no other neurotic cases on either side in the family, which is a large one. The patient,

who was a plump, healthy girl until the beginning of last year (1887), began, early in February, without apparent cause, to evince a repugnance to food, and soon afterward declined to take any whatever, except half a cup of tea or coffee. On March 13th she traveled from the North of England and visited him on April 20th. She was then extremely emaciated, and persisted in walking through the streets to his house, though an object of remark to the passers-by. Extremities were blue and cold. Examination showed no organic disease. Respiration, twelve to fourteen; pulse, forty-six; temperature, ninety-seven degrees. Urine normal; weight, four stone seven pounds; height, five feet four inches. Patient expressed herself as quite well. A nurse was obtained from Guy's, and light food ordered every few hours. In six weeks Dr. Leachman reported her condition to be fairly good, and on July 27th the mother wrote: "K. is nearly well. I have no trouble now about her eating. Nurse has been away three weeks." This story, in fine, is an illustration of most of these cases, perversions of the "ego" being the cause and determining the course of the malady. As part of the pathological history, it is curious to note the persistent wish to be on the move, though the emaciation was so great and the nutritive functions at an extreme ebb.

Galvagni¹⁴ reports successful treatment of hysterical vomiting by gavage twice daily. His mixture consisted of one pint of bouillon, four well-beaten eggs, salt, and a little Marsala wine; for two days the vomiting continued, but afterward ceased and entire recovery ensued.

J. Schlesinger⁶⁵⁰ communicates the case of a young girl who suffered with disturbance of the stomach which was diagnosticated as ulcer, although there was no hæmatemesis. She recovered completely under a milk treatment rigidly carried out. One year subsequently the patient was again taken sick with a violent pain in the stomach, loss of appetite, nausea, vomiting, and complete sleeplessness. No kind of food could be borne, and the largest doses of morphine, even when administered subcutaneously, had not the least effect. The diagnosis of ulcer of the stomach was then made. It was learned, however, that in the boarding-house in which this patient lived was a girl affected with hysterical neurosis of the larynx, and that in a short time two other young girls, including the patient, became similarly affected. A diagnosis

of hysterical neurosis of the stomach was then made, the patient put upon bromide of sodium, and complete recovery soon occurred.

The fact that carcinoma of the stomach may be simulated by grave forms of hysteria seems scarcely possible, and yet cases are encountered in which, after long observation, the diagnosis is uncertain. Hysterical cases have even been encountered in which, with all the subjective symptoms of gastric cancer, there has eventually appeared an apparently pathognomonic tumor, said tumor being composed of the patient's own hair which she had swallowed.

Stomach cough is a reflex form of cough, induced by irritable conditions of the stomach, particularly of the peripheral sensory nerves in this organ; it also occurs in hysterical subjects. A case ³²⁶_{Dec. 9, '97} is reported in which the treatment was chiefly dietetic, with the most satisfactory results.

Séjournet ¹⁵²_{Nov. 1} has written an article of value on the pathology of vomiting, especially in diseases accompanied by spasmodic cough. He refers the nausea to irritation of a vomiting centre by reflex action without the actual disease of the stomach, and as instances cites spasmodic laryngitis, whooping-cough, phthisis pulmonalis, and sea-sickness.

GASTRODYNIA.

Gastrodynia is an affection often diagnosticated with some difficulty. It is very commonly associated with a very acid gastric juice. Saundby ²⁶_{Aug. 1} has prepared the following table for purposes of differential diagnosis:—

Symptoms.	Gastrodynia.	Atonic Dyspepsia.	Gastric Catarrh.	Ulcer.	Cancer.
Character of pain	Dull, heavy	Dull, heavy	Burning soreness	Acute stab- bing	Cutting
Locality	Epigastrium	Epigastrium	Behind ster- num	In one spot	Epigastrium
Incidence	Immediately	After 1 or 2 hours	After 2 or 3 hours	Immediately	After 1 or 2 hours
Tenderness	Sometimes	None	None	Usually	Usually
Vomiting	Usually	None	Often some retching	Usually	Usually
Hæmatemesis	None	None	None	Usually	Usually
Tongue	Clean	Clean	Furred	'Clean'	Variable
Tumor	None	None	None	None	Usually
Age	Usually under 30	Any age	Any age	Usually under 30	Usually over 40
Sex	Usually fe- male	Either	Either	Usually fe- male	Usually male

G. Ranney²²⁴_{Aug.} has described some instances of gastralgia which were most favorably affected by antipyrin in ten-grain (0.66 gramme) doses every two hours, three or four doses completely aborting the attack. I have frequently tried smaller doses with much advantage in controlling gastric neuralgia.

RUMINATION.

Rumination is a peculiar digestive disturbance described by Karl Dehio,²¹_{Jan. 14} Chr. Jürgensen,⁴_{Nov. 12} and Goldenhorn.⁵⁷¹_{No. 4} A characteristic case is reported as follows:—

A male member of a quiet, healthy family had been well and sound up to the age of twelve, when a violent and prolonged attack of whooping-cough made its appearance, the paroxysms being invariably associated with vomiting. He got rid of the disease ultimately, but from that time a regular habitual rumination of all his meals set in until he was sixteen years old. Without any effort or straining on his part, a medium-sized morsel of the food ingested would rise up into his mouth, to be once more thoroughly masticated and again swallowed. Then another similar portion would find its way into his oral cavity, and so on. Not the slightest nausea or pain or any unpleasant sensation was ever experienced by the youth during this curious process; on the contrary, he rechewed the gastric contents with perfect gusto. The rumination commenced about a quarter of an hour after the meal and lasted for half or one hour, seldom longer. The taste of the cud was not sour, according to the patient. He never had any gaseous eructations. His appetite was always excellent, the youth being a large eater all through. Later on the rumination gradually became less frequent, and at present occurs only after exceptionally liberal meals, especially after pastry and sweets, and invariably after eating porridge. Of late he has suffered now and then from slight dyspeptic symptoms (such as nausea and gastric pain), which, however, always disappeared after a purgative and some restriction of his dietary. A careful examination proved that the patient's stomach was quite normal both in chemical and mechanical regards.

It has been thought by Dumur, Poensgen, and Oser that atony or even paralysis of the cardia represent a necessary and essential condition for the occurrence of rumination in man. Dehio, on the

contrary, thinks that it is simply a reflex motor neurosis of the stomach, the predisposing causes of which are neurasthenia and the habit of eating very much and hurriedly. An analogous phenomena obtains in whooping-cough, and in the instance cited it was probably caused by an abnormally increased irritability of the gastric mechanism.

GASTRIC ULCER.

The review of this department of medicine in the last ANNUAL covered pretty thoroughly the etiological relations of gastric ulcer. In the same article the experiments of Decker were cited, in which dogs were repeatedly fed through the stomach-tube with semi-solid food heated to 120° F. (49° C.), and gastric ulcer was found to be the result. Ritter¹¹⁴_{M.J.} has collected a number of clinical observations to prove that gastric ulcer can be produced by violence acting through the abdominal walls. Several such cases have been studied in Leube's clinic, and an autopsy of Hoffman's offers additional evidence in the same direction. Ritter made some experiments on dogs to prove that ulcer could actually be brought about in this way. The animals received a rather heavy blow over the region of the stomach and chloroform narcosis was then continued until death resulted. The autopsies revealed regions of hæmorrhage beneath the mucous layer, separating it from the tissues below. There is no doubt that the gastric juice would have soon produced ulcers at these spots had the animals been permitted to live.

Letulle³⁵_{P.M.} claims to have established a correlation between the evolution of an infectious malady to the development of ulcerous lesions at the level of the gastro-duodenal apparatus. He has been able to reproduce, as an experimental proof, upon certain animals the same mucous and submucous lesions, not only with the pure cultures from dysentery, but even with the staphylococcus pyogenes aureus. The lesions thus obtained varied from mere ecchymoses to most extensive burrowing ulcerations, which threatened to perforate the walls of the stomach. He believes that we ought to conclude from these facts that the mechanism of these ulcerative lesions of infectious origin is of a double nature: first—and this he believes to be the most rare cause—they must be dependent upon the ingestion of pathogenic germs, which develop and grow upon the surface of the gastro-duodenal membranes, and, secondly, that they are dependent upon the morbid elements which are

carried by the blood-vessels and lymphatics to the meshes of connective tissue beneath the mucous membrane. There the parasites, finding a favorable soil for their development, hinder the absorption of the nutritive materials of the stomach, and thus expose the mucous membrane to the corroding action of the acids which are in contact with it.

A. F. Rasmussen⁸⁷¹_{Jul. 19} states that at autopsies he has usually found a furrow upon the stomach, which he is disposed to attribute to pressure from without and to compare with the furrow from lacing which is found upon the liver. In some cases he has seen such a furrow extend from the liver across the stomach and upon the descending colon. Along the indented part of the stomach Rasmussen found the serous coat thickened, while the mucosa was atrophied. He offers the hypothesis that pressure upon the stomach in all, or at least many, cases is the cause of the formation of ulcer. He bases this hypothesis upon the observation that symmetrical scars following ulcer of the stomach are often seen upon the anterior and posterior walls of the stomach, and that they have their seat for the most part in the smaller curvature, and more frequently on the posterior than the anterior wall—places which are especially exposed to pressure, while the greater curvature is more movable.

Hayem¹²⁶_{Oct. 18} has recorded some observations by Langevinier which go to prove that the epigastric surface temperature is greater than that taken in the axillæ, and serves as a diagnostic point between simple ulcer and cancer of the stomach. In chlorotic subjects presenting the phenomena of gastralgia elevation of the temperature in the epigastrium is an indication of the formation of round ulcer.

The importance of the presence of an excess of free hydrochloric acid as a diagnostic feature in ulcer of the stomach has been conceded. The organic acid present in the early stage of digestion in the normal subject is too small to be seriously considered.

Gerhard²²_{July 18} nucleates the cardinal points in the diagnosis of gastric ulcer under hæmorrhage, hyperacidity of the gastric juice, long duration of the disease, pain peculiarly located, contraction or dilatation from insufficient ingestion of food.

Dr. Ord²_{Mar. 10} also presented to the London Medical Society some interesting relations of gastric ulcer, noting particularly the possi-

bility of the coexistence of gastric ulcer with the existence of pericarditis and endocarditis. He referred to Dr. Buzzard's observation that acute rheumatism was the effect of irritation of the medulla oblongata, and said that when the coincidence of the signs of gastric ulcer with those of cardiac inflammation had been observed in at least four cases, the occurrence appeared to be worthy of serious thought. Several explanations were forthcoming—first, was it possible that in an anæmic person with oversensitive pneumogastric nucleus, gastric irritation (well known to be capable of producing cardiac disturbances) could be capable of producing cardiac lesion? second, could pneumogastric irritation be the common cause of gastric ulcer and cardiac inflammation, the pneumogastric irritation being determined by excitation proceeding from the uterine organs in a person already anæmic and prone to active reflex disturbance? third, was it possible that both sets of symptoms might be disorders of nutrition arising out of anæmia?

Anæmia was known to have as an association optic neuritis. Might both the ulcer and the cardiac inflammation be disturbances of nutrition, parallel or equivalent to optic neuritis? Dr. Ord cited a case at present under his care, in which the signs of gastric ulcer, of cardiac inflammation, and of optic neuritis were present in conjunction with extreme anæmia; also a case recently under his care in which myocarditis had been observed, post-mortem, as one of the associations of pernicious anæmia. On the whole, Dr. Ord was inclined to regard the curious combinations of lesions noticed as disturbances of nutrition consequent on anæmia, and appealed to the members of the Society for any information that they could give on this interesting subject.

The fact that in cases of gastric ulcer the presence of hydrochloric acid in excess has been very constantly found may be interpreted as a consequence of gastric irritation producing increased secretion quite as well as the reverse. Ritter and Hirsch¹¹⁴ determined by experiments in healthy subjects that (1) the maximum acidity and the time of its occurrence in healthy persons varies not only individually, but also in the same person on different days, *cæteris paribus*; (2) that in anæmic and chlorotic persons gastric ulcer may co-exist with less acidity than normal; therefore, hyperacidity does not give rise to ulcers in chlorosis and anæmia and does not cause the greater number of ulcers; (3) that the

acidity in chlorotic and anæmic persons may be due to the formation of organic acids when food containing a large quantity of carbohydrates is consumed; (4) in cases of stenosis of the pylorus connected with thickening dependent on gastric ulcer, in which a tendency to lactic or butyric acid fermentation was present, one should give a diet from which hydrocarbons are excluded more sedulously than in other forms of gastric ulcer.

Treatment.—On the treatment of gastric ulcer Gerhard²³_{July 18} observes that in recent cases milk diet often suffices, but in old ulcers in which structural changes have taken place milk is frequently not borne at all. Peptones often proved unserviceable, because they occasioned a prolific secretion of gastric juice. I have used malted milk with so much advantage that I rarely employ milk in any other form in this affection. Peptones are useful in cases of profuse hæmatemesis in which rectal alimentation must be practiced. In such cases as present continuous secretion of gastric juice this may be diverted from the ulcer by a meat or egg diet. A single estimate of acidity has no satisfactory diagnostic value.

TUMORS OF THE STOMACH.

Several cases of gastrolith in man have been reported in the current year. Kooyker, of Groningen,¹¹⁴_{May 14, 1882} described the case of a druggist aged thirty-five years who had a circumscribed tumor in the epigastric region, the position of which varied on respiration, and which was tender on pressure. Medicines had no permanent effect upon it. Spleen, liver, and kidneys were normal as to position and size. The appetite was very good and the bowels were regular. Vomiting of a small quantity of fluid containing mucus and bile, but always free from HCl, occasionally took place. Nausea was constant, and it was said that hæmatemesis occurred, but this was not actually observed. Gradual emaciation followed, with cachexia, and indolent swelling of the left supraclavicular and axillary glands was noticed. The patient was examined under an anæsthetic and the stomach washed out, but exploratory incision was steadily refused. The diagnosis, according to the probabilities, was cancer of the stomach. The case ended fatally, and the autopsy showed that the stomach, which was of normal size, contained a concretion having the outline of the organ and almost filling it. At the pyloric end lay two smaller fragments of the size

of hens' eggs. The weight of the tumor was eight hundred and eighty-five grammes (a little over 28 ounces). It had a strong faecal odor, but contained no skatol. No nucleus was present. Microscopic examination showed starch granules, cells containing chlorophyll, bundles of vessels, but nothing to determine the animal origin of the concretion. Chemical analysis showed that it contained 0.56 per cent. of nitrogen. It was observed that with the exception of Langenbuch's case, described in 1884, which contained no hair, all the cases observed in the human subject were composed more or less of hair. In the present case the tumor was identical in constitution with the "food balls" of ruminants.

Such concretions⁶ are not often found in the human stomach, though the bezoar of the abomasum and intestines of ruminants is well known, and in olden days was very highly esteemed as a remedy against poisons and infectious diseases, being even worn as a charm. Human intestinal agglomerates are occasionally found in oatmeal-eating districts, and have sometimes been dignified by the name of "avenoliths." An enterolith was found by Laugier in a human subject, the nucleus of which was formed by a piece of liquorice-root. True gastroliths are, however, occasionally found in human stomachs; thus Schönborn was able to collect seven such cases, all of which appeared to have formed round a nucleus of hair; one of these weighed two kilogrammes.

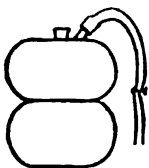
Hair-tumor of the Stomach.—John Berg³⁷¹ reports the case of a married woman aged twenty-six who had suffered for three years with symptoms of dyspepsia and anaemia and with attacks of vomiting of glairy mucus. For two years there had been noticed a tumor in the epigastric region, and it had grown more rapidly during the last six months. She entered the Seraphim Hospital in Stockholm on May 31, 1887. In the epigastric and left hypochondriac region, between the prolongation of the parasternal line and the left mamillary line, was a tumor as large as the hand, with a concave upper and convex lower border. It could not be displaced toward the region of the kidney. The spleen was in its normal position. Laparotomy showed that the tumor was in the stomach, which was opened by an incision six or eight centimetres long parallel to the greater curvature. The tumor was composed of hair, short and long, forcibly compressed. It was cut up and removed piecemeal. The whole weighed about nine hundred

grammes. The wound was closed by twenty-three sutures in two rows. Union by first intention and complete recovery ensued. The mother of the patient said that when about three years old she had a habit of chewing hair, but the patient denied having done so since she could remember. With the cases of Schönborn and Knowsley Thornton,⁶_{Nov. 24} this makes three cases of operation, all successful, for hair-tumors.

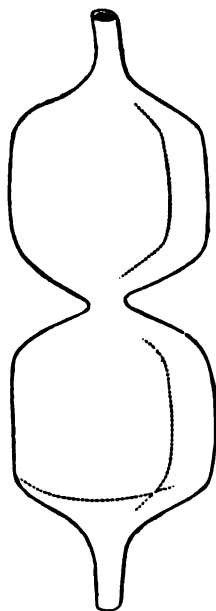
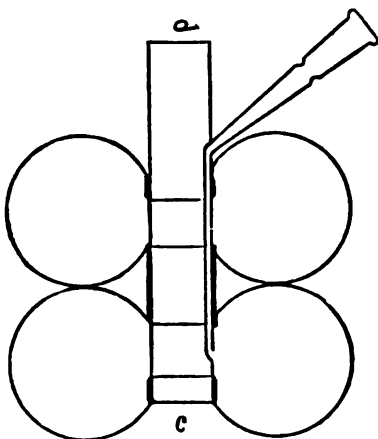
Cancer.—Flatow³¹⁹_{July 7} describes the development of gastric cancer in the cicatrix of a round ulcer. The statement of Hauser that cicatrized ulcers of the stomach dispose to the development of gastric cancer is strengthened by this observation. It also supports Virchow's view of the etiology of tumors, that they preferably arise at points exposed to frequent irritation. Ducheneau²¹¹_{v. 1, p. 284} presented anatomical specimens to the Medical Society of Lyons, in which a cancer of the stomach extended to the omentum, became adherent at the umbilicus, and after ulceration permitted the discharge of pus through the umbilicus. During life it was considered to be simply an umbilical abscess, but the autopsy proved that the cancer of the stomach had extended to the transverse colon, forming a tumor which became adherent to the umbilicus. This tumor presented a cystic cavity communicating with the stomach through the transverse colon.

Fräntzel⁴¹_{Apr. 15} has also placed on record a case of cancer of the stomach which ruptured externally. It appears that in the pit of the stomach there was a distinct round tumor, which was soft to the touch and painful upon pressure. Somewhat to the right of the xyphoid process was a prominent spot which was tightly stretched and showed fluctuation. A needle was thrust into the fluctuating part of the tumor, and one and three-fourth ounces of a thick, cloudy, fetid fluid, mixed with air-bubbles, were evacuated; the fluid was not of a distinctly foul odor, and contained pus, fat, and detritus. Subsequently, under an anæsthetic, the little fistula was divided and entrance gained to a cavity the size of a small apple, which was filled with ichorous, foul-smelling pus. Coughing expelled air of a carrion-like odor. At the autopsy a tumor the size of a hen's egg was found in the region of the pylorus. The interior of this tumor had broken down in suppuration, and in some places where the decay reached to the periphery of the tumor there was a direct communication with the abscess.

Scheimpflug⁸ has described Billroth's new balloon cannula for closing the fistulous orifice of the stomach after operation. The balloon is adjusted in the following manner: It is perforated at the upper end and fastened to the cannula by silk threads at the upper portion. After this the lower portion is adjusted in a similar manner and the whole balloon tied down in the middle to the cannula at a point corresponding to the fistulous opening, so that the lower portion of the original balloon (now an individual cushion, like the upper one)



BILLROTH'S BALLOON CANNULA.
(*Wiener Klin. Wochenschr*/t.)



projects beyond the end of the cannula in a crater form if inflated.

The modification shown in the next figures is that the intermediate portion of the bags is tied down by silk thread to the cannula at the place which corresponds to the walls of the fistula, so that if the bags be inflated they will bulge out in such a manner as not to press on the margins of the fistula, all irritation and stretching being avoided and an interspace left through which medicinal applications may be placed.

Hampeln¹¹⁴ has described a form of intermittent fever in connection with medullary carcinomas of the stomach in which the

chill, fever, and sweating stages were as pronounced as in a true intermittent. The same phenomena have heretofore been noticed in connection with cancer of the liver, in which the biliary passages were involved.

Among the cases of cancer of the stomach occurring at an early age must be placed that of Koster,³³⁸_{May 19} who demonstrated at the post-mortem its existence in a girl of seventeen years.

Dieulafoy,²⁶_{Feb. 1} in considering the diagnostic features of cancer, places great stress on the presence of chlorohydric acid in chyme. A few drops of a concentrated solution of "vert brilliant" placed in a test-tube containing distilled water gives a blue tint. If the distilled water were replaced by fresh gastric juice, the color produced will be slightly green, and if the muriatic acid be in excess the color will be green; but if, on the contrary, this acid be absent, the effect will be the same as in the case of distilled water. Now, in cancer of the stomach, chlorohydric acid is always greatly diminished and often wanting altogether, according to Dr. Debove. Consequently the continued absence of this acid in the gastric juice is a certain sign of cancer of the stomach.

The true position of Riegel and several other observers in the much disputed question of the absence of free hydrochloric acid in cancer of the stomach is that in its constant presence is found the strongest proof of the absence of cancer, because the absence of hydrochloric acid in the gastric secretion obtains in several diseases of the stomach. But, positively considered, its absence in cancer cases is attested by so many different observers as to make this sign of importance diagnostically notwithstanding that a few cases to the contrary are cited, besides many negative cases, that is, cases in which hydrochloric acid was found to be absent, but in which no cancer was present.

DISEASES OF THE LIVER.

CIRRHOSIS.

The study of cirrhosis of the liver has received considerable impulse in the past year from the fact that the tendency to systematize and arrange the subject upon well-defined lines has become more prominent. There seems, also, more agreement among pathologists as to the exact nature and causation of the various

forms of interstitial hepatitis. For example, Klein has described a form of acute interstitial hepatitis in scarlet fever, and Crooke¹¹⁰² has called special attention to the fact that during interstitial hepatitis in scarlet fever the inflammation undergoes resolution in the majority of cases and clears up as the patient recovers. Acute infectious disease may, therefore, be regarded as a possible and not infrequent antecedent of cirrhosis.

Hogben³² has called attention to the enlargement of the liver so frequently found in rickets as commonly a form of interstitial hyperplasia dependent upon a definite increase of the interlobular connective tissue, the newly formed fibres and granulation cells being found developed to an abnormal extent along the interlobular septa. In the normal liver of the human subject lobule borders upon lobule with ill-defined boundaries, and the peripheral capillaries of one directly communicate with those of another. There is also a very marked thickening of the coats of the bile-ducts, apparently due to hypertrophy of the circularly disposed muscular fibres in the walls of the duct with multiplication of the biliary canaliculi; in other words, that form of fibroid induration which goes by the name of hypertrophic cirrhosis. The changes in the bile-ducts and canaliculi point to a biliary hepatitis, which it is reasonable to suppose may be originated by a chronic obstruction to the bile, in turn attributable to the chronic gastro-intestinal catarrh, which is a constant and early symptom in all cases. The bile-ducts are commonly involved in the general catarrhal condition, and the chronic incomplete biliary obstruction consequent thereon may be supposed to give rise to an interstitial hepatitis such as described; in other words, a cirrhosis from obstruction.

G. Monroe Smith,² has suggested that the confusion in description of forms of cirrhosis has arisen (a) from confounding cause with the morbid anatomy; (b) from describing partial cirrhosis as general; (c) from considering post-mortem appearances in early and late epochs of the same disease as two distinct varieties. As an illustration of the first error, he cites Charcot's description of a condition characterized by considerable enlargement of the liver, with jaundice, not usually much ascites, and a rapid course. After death a general and uniform increase of connective tissue in the organ was found, with proliferation of the

smallest bile-ducts and capillaries. To this disease he gave the name of "biliary cirrhosis," indicating thereby its mode of origin from blocking of the bile-ducts. The term "biliary" has been transferred from its etiological sense and made to mean increased formation of the small ducts, a condition not in the least characteristic of this form of cirrhosis, but existing quite as markedly in the alcoholic and in the cyanotic form. An example of the second source of error may be found in tubercular cirrhosis. Tubercles frequently form in the liver, generally in or near the capsules, with occasional infiltration in the interior of the gland in the interlobular spaces. If the patient lives long enough, this is sure to lead to patches of sclerosed tissue and new formation of bile-ducts; yet this process is surely only localized inflammation around the irritating masses of tubercle.

As a rule, no lesion of the liver is found in diabetes, unless the patient also happens to be an alcoholic subject; and although Charcot and Hanot have described two cases of enlarged liver with sclerosis in non-alcoholic patients, they both were subject to tubercular disease of the lungs.

Again, the period in the course of the disease must be noted, as monolobular becomes indistinguishable from multilobular, and an enlarged liver may shrink till it is exceedingly small.

On this basis George Monroe Smith,² suggests the following classification: 1. Obstructive cirrhosis (*a*) due to impediment to flow of bile, biliary cirrhosis; (*b*) to the flow of blood from the liver, as in pulmonary or heart disease; (*c*) cyanotic cirrhosis. 2. Irritative cirrhosis, which is caused by the irritation and chronic interstitial inflammation which follows some poison brought to the liver by the portal vein or hepatic artery: (*a*) alcoholic; (*b*) malarial; (*c*) syphilitic.

The obstructive forms are always monolobular, that is, the connective tissue grows irregularly; some lobules are divided up by septa, while others escape altogether. The syphilitic is found only in children. Acquired syphilis appears never to produce general cirrhosis. The malarial is also chiefly seen in children.

In this connection it might be interesting to note that John Guit  ras, of the United States Marine Hospital Service, has described a venous hum produced in an enlarged vein of the suspensory ligament of the liver. Whether this enlarged vein is physio-

logical to the adult, a remnant of the portal vessel, or of diagnostic importance in obstruction, is undecided.

In connection with division into hypertrophic and atrophic types, it must be remembered that the liver very readily enlarges; a rich and copious dinner, especially when combined with wine or spirits, may increase its size one-third.

In the form of irritative cirrhosis, the initial hypertrophic stage is not marked by characteristic symptoms; hence is frequently not noted clinically, but when jugulation of the portal vessels occurs the signs of portal obstruction appear, and with these symptoms the liver usually can be defined as a smaller organ.

Carpentier²⁸⁸_{Apr. 15} probably represents the view of the French school, that in addition to hepatic cirrhosis, hypertrophic, and atrophic, a third form exists, characterized by the fatty degeneration of the hepatic parenchyma and called fatty, hypertrophic, or atrophic, according to the size of the liver. In the fatty form of hypertrophy, death occurs most often by the reabsorption of the elements of the biliary secretion than by acolia, and that the elevation of the temperature can perhaps be attributed to a taking up by the blood of the fever-producing elements of the bile, and not to the interstitial inflammatory process.

The occurrence of cirrhosis in the young has continued to attract attention. Causatively the cases can be classed upon the foregoing lines suggested by Munroe Smith²_{June 30}: gastro-intestinal catarrh, faulty digestion, the habitual use of stimulating articles of food may excite interstitial hepatitis, and ptomaines may be as irritating or even more so than alcohol. Gibbons²⁰⁶_{Feb.} has reported a case of biliary cirrhosis in a child eleven months old. At the autopsy the liver weighed ten ounces, the right lobe was completely covered by the ribs, the left lobe extended two inches below the ensiform cartilage. The liver was of a uniform yellow color. It was firm and resistant, the capsule thickened and adherent, surface uneven, with minute nodules about the size of mustard-seed. The liver cut with distinct fibrous resistance; the section showed that the bile staining was uniform throughout the organ; the cut surface was granular; the lobules distinct; the organ anæmic; the gall-bladder contained a small amount of bile; the common duct was pervious. Spleen was greatly enlarged, elongated, curved, and its substance soft and pulpy, weighing eight ounces.

Under the microscope, thickening of the capsule was seen with bands of fibrous tissue surmounting each of the lobules, the latter varying in size ; some were of normal size, but the greater number were much smaller, many consisting of a few hepatic cells massed together and encircled by broad bands of fibrous tissue ; the hepatic cells were nowhere arranged in regular radiating rows, as in the normal liver. In the encircling bands of fibres, duct-like structures were seen radiating between the fibres. Under the high power these duct-like structures were seen to be formed by two rows of cubical epithelial-looking cells, placed parallel to each other. In parts of the section fibres were seen passing from the encircling bands in between the hepatic cells toward the centre of the lobule. The hepatic cells were nowhere normal, but in some of the lobules they were more disorganized than in others. The cells in most of the lobules were distorted, bile-stained, and massed together, the protoplasm granular and containing pigment granules. The disorganization of the hepatic cells was advanced so far in some of the lobules that the structure of the cells was completely destroyed, nothing remaining except shapeless, yellow masses.

When the cirrhosis is obstructive, originating from catarrhal or other process involving more or less impediment to the flow of the bile from the liver, one is apt to find, as in Gibbons' case, jaundice, more or less fever, nausea, constipation, and enlargement of liver. Death usually supervenes from cholesteræmia, but in some instances (and Gibbons' case is one) the patient survives until the stage of contraction. It is, however, observable that when the liver contracts it does not become so distorted and hob-nailed as in ordinary cirrhosis ; the more uniform distribution of the new growth may account for this variation.

Nothing new, as to treatment, has been suggested during the year.

JAUNDICE.

Jaundice at the present time is believed to be confined to two varieties, one resulting from the presence in the blood of the acids and pigment of the bile, the hæmatogenous, anhepatogenous, or hæmoglobinogenous form ; the other, the obstructive or hepatogenous form, resulting from the absorption of the bile already formed, the escape of which cannot be effected owing to obstruction in the hepatic ducts or in the ductus communis choledochus, or to some vasomotor influence.

The hæmatogenous variety is due to the presence of free blood-pigment in the circulation. According to Ponfick this may be as granular, disintegrated red blood-corpuscles, or as dissolved hæmoglobin. The cutaneous jaundice is the result of the transformation in the blood of hæmoglobin into bilirubin. It occurs when more blood-pigment is set free than can be disposed of by the spleen, liver, or kidneys. Frederick has explained this form of jaundice without obstruction on the ground that the biliary acids are absorbed and converted into coloring matter, and Murchison says the coloring matter of the bile may be absorbed from the intestine passing into the blood and resulting in staining of the tissues. The causes predisposing to catarrhal jaundice are exposure to cold, indigestion, abuse of alcohol, climatic or seasonal influences, and, finally, sometimes an epidemic infectious influence. The so-called epidemic jaundice has been recognized and described by Murchison, Kelsh, and many other writers. Parmentier¹⁰⁰ p. 112, w. says that it seems proven by the experience of military surgeons that jaundice may be a specific infectious malady developed in marshy regions and in much the same surroundings as those which produce malaria or typhoid fever. Kelsh is even of the opinion that all forms of ordinary catarrhal jaundice, sporadic or epidemic, are due to an infectious organism. Hirsch¹¹⁰³ gives particulars of thirty-four epidemics of jaundice, all of which were purely local, confined to one place or part of a place, such as a camp, barracks, works, or even a house. The precise causation is not clear, but in a number of outbreaks it is distinctly associated with sanitary defects and nuisances, such as stagnant sewage, choked drains, and the like. Russell² p. 11 refers to a group of cases of epidemic jaundice, eleven in number, which occurred in five families living in Parkhead, Glasgow.

That ordinarily the points of origin of the bile-ducts are affected is the view of Ebstein, Virchow, Vulpian, and Charcot. The cause of the inflammation of the ducts, whatever be its locality, has been thought to be an extension from the duodenum, and Frerichs has reported clinical cases showing that in thirty-four out of forty-one cases the symptoms of gastro-duodenitis preceded those of jaundice. Chauffard³⁵ p. 61 has made an argument to show that in many cases the sequel of events is first an accumulation of irritant products in the liver causing an irritation and inflammation

of the hepatic ducts with intestinal inflammation following it. The investigations of Bouchard and his pupils, showing the important rôle played by the toxic products of digestion and metabolism, lend support to Chauffard's view. The liver ordinarily destroys much of the toxic substance carried to it, but if the portal blood is overloaded with these then there is hepatic "insufficiency," and a poisonous irritating bile results.

Parmentier¹⁰⁰_{p.138} has shown that in those slight forms of jaundice in which bile-pigments do not appear in the urine in appreciable quantity the spectroscope furnishes a very delicate and accurate test. Besides, Chauffard⁹²_{Rept. '97} has established the fact that in some cases, at least, the urine is diminished in amount during the attack. By the tenth or twelfth day there is a crisis with large excretion of urine and a corresponding increase in urea.

Several German observers have of late investigated the intestinal disturbances produced by the absence of bile from the intestine in jaundice. Müller¹¹⁴_{Bd.12,H.1,2} claims to have shown that in this condition there is an increase in undigested fat from 6.9 and 10.5 per cent., the normal amount, to 55.2 and 78.5 per cent. Strümpell¹¹⁰⁴_{Bd.1} claims that the clay color of the stools is due to the undigested fat, and that in jaundiced patients who are fed on free fat food this peculiar odor is not present. It is well known that the pancreatic duct may be also obstructed in jaundice, but Müller denies that this is the cause of steorrhœa, and cites cases in which, though this duct was obstructed, the stools contained less fat than is the case in catarrhal jaundice. The absence of the bile does not affect the digestion of starchy foods, but lessens slightly that of albuminoids. In this connection it may be well to review the uses of the bile within the economy. Its action on starch is very slight and, consequently, not important. The bile was anciently believed to exert a purgative effect. Schiff proved the bile salts to be capable not only of exciting peristalsis, but contraction of the inorganic muscular fibres of the intestinal villi, thereby unloading the lacteals of fat and indirectly promoting absorption. In pathological conditions interfering with the normal flow of the bile, the stools are light colored, dry, and infrequent. The bile also has an antifermentative property, for, according to the experiments of Bidder, Schmidt, and Flint on dogs, the fæces of these animals when fed on meat were always particularly offensive.

Experiments made by tying the common bile-duct, thereby preventing the entrance of any bile into the intestine, and causing its discharge externally through a fistula, showed emaciation, voracious appetite, frequent and very offensive chalk-colored stools. Fæces contained fat; animals refused to eat fat. Great emaciation and prostration finally ensued, and the dogs died of inanition.

The bile is, doubtless, an excretion, but the alimentary canal does not seem to be the channel by which all of this is thrown off. This is evident with regard to the biliary salts from the experiments of Dalton, Bidder, and Schmidt, and investigation has shown that the bile-pigments are decomposition products of normal blood coloring matter, and that they are in great part reabsorbed, further decomposed, and finally excreted as urobilin, the characteristic pigment of the urine. The constitution of the bile is not materially altered in pathological states of the liver, but in states of general malnutrition and wasting diseases the secretion is much diminished.

W. G. Collins, ⁶_{Nov. 17}, has found that tight lacing has a decided effect on lessening the flow of bile. His experiments were made on guinea-pigs, "compression being made around guinea-pig's waist, if such by courtesy can be allowed to exist." He found that before the tight lacing began bile was being secreted at the rate of 8.4 cubic centimetres per hour; during the tight lacing this fell to the rate of 4.5 cubic centimetres per hour, and after removal of the constriction again rose to 7.8 cubic centimetres per hour. The free and unfettered action of the diaphragm, then, is essential to normal biliary secretion and affects evacuation of the bile-ducts much in the same way as succussion of the liver which saddle exercise affords, which led Sydenham to opine that the outside of a horse is the best thing for the inside of a man.

Lussana suppressed digestion in a dog by cutting the pneumogastric nerve, the animal surviving twenty-four days. Great emaciation and marked evidences of inanition supervened. After death the gall-bladder was found full of dark, thick bile, which, upon analysis, showed as compared with the average of the normal secretion a diminished proportion of water and an increase of biliary salts, thus proving that the latter substances should be regarded as derived from the destructive metamorphoses of the tissues and intended for excretion.

Bile seems, therefore, a something to be gotten rid of, and it lends great interest to a study of the relation of drugs to the secretion of bile. The experiments of Rutherford¹⁹¹ have been most generally accepted; his table of results is herewith appended. The animals experimented on were dogs. They were fed on lean meat at three or four o'clock in the afternoon and operated on at ten o'clock the next morning. A temporary fistula was the method employed. The animals were first curarized to prevent disturbing effects of irregular muscular actions upon the flow of bile and artificial respiration was maintained.

RUTHERFORD'S TABLE SHOWING THE EFFECTS OF DRUGS ON THE SECRETION OF BILE.

NAME OF DRUG.	Dose in Grms. per Kilo of Body Weight.	Bile Secreted per Hour.	
		Before.	After.
Curare in small doses causes in the first four to five hours a uniform secretion, which gradually diminishes	}	0.35	
		0.25	
		0.15	
Podophyllin	0.9	0.04	0.47
"	0.23*	0.52	1.01
Aloes	6.9	0.34	0.69
"	12.0	0.26	0.93
Rhubarb	3.06	0.17	0.32
Colchicum	2.5	0.13	0.45
Euonymin	0.26*	0.25	0.47
"	0.21*	0.07	0.46
Ipecac	2.2*	0.24	0.55
"	0.49*	0.18	0.58
Colocynth	0.53*	0.20	0.45
"	0.4*	0.16	0.27
Jalap	1.2*	0.16	0.29
Sodium sulphate	32.3*	0.25	0.38
Potassium sulphate	10.7	0.31	0.47
Cream of tartar	37.0	0.23	0.33
Corrosive sublimate	0.0077*	0.17	0.47
"	0.0071*	0.20	0.55
Corrosive sublimate	0.005	} 0.48	0.72
Calomel	0.101		
Corrosive sublimate	0.0027	} 0.22	0.85
Calomel	0.054		
Sodium benzoate	1.320	0.22	0.64
Ammonium benzoate	0.737	0.24	0.54
Sodium salicylate	1.00	0.17	0.56
"	1.55	0.26	0.66
"	2.15	0.32	0.89

* Asterisk indicates that the drug injected into the duodenum was dissolved or mixed in bile and was not in watery solution, as the others.

Rutherford distinguishes between those substances which excite biliary flow and those which have no effect upon the liver,

but induce hypersecretion of the interstitial glands. Among these substances are the following:—

INFLUENCING BILE SECRETION.

Resina podophylli.
 Euonymin.
 Hydrastin.
 Rhubarb—certain, though not powerful.
 Senna—very feeble.
 Colchicum—powerful.
 Aloes—60 grains act powerfully on dog.
 Scammony—feeble.
 Colocynth—in large doses, powerful.
 Jalap—feeble.
 Taraxacum—very feeble—no purgative effect.
 Ipecacuan—powerful.
 Dilute nitro-hydrochloric acid—considerable power.
 Sodium sulphate—moderately powerful.
 Potassium sulphate—uncertain.
 Sodium phosphate—powerful.
 Sodium chloride—feeble.
 Sodium benzoate—powerful.
 Ammonium benzoate—powerful.
 Sodium salicylate—very powerful.
 Corrosive sublimate—very powerful.

INFLUENCING INTESTINAL SECRETION.

Croton-oil.
 Magnesium sulphate.
 Sulphate of manganese.
 Castor-oil.
 Ammonium chloride.
 Gamboge.
 Colchicum—powerful.
 Scammony—powerful.
 Colocynth—in large doses, powerful.
 Jalap—powerful.
 Sodium sulphate—powerful.
 Potassium sulphate—powerful.
 Sodium phosphate—moderately powerful.
 Sodium chloride—unequivocal.
 Calomel—powerful.
 Corrosive sublimate.

As regards the salts of mercury, Rutherford “made the remarkable discovery that while calomel does not excite the dog’s liver, corrosive sublimate stimulates it powerfully.”

His experiments lead him unquestionably to the conclusion that calomel when given by the mouth, and thus brought in contact with the gastric juice, acts upon the liver, because when thus administered it is partially converted into corrosive sublimate. These experiments further revealed the fact that when those substances (castor-oil, magnesium sulphate, ammonium chloride, gamboge) which stimulate the intestinal secretion but not the liver were employed the hepatic secretion was depressed.

Recently Prévost and Binet¹⁸⁷_{May, June, July} have published the results of most exhaustive inquiries into the subject, controlling and testing the results of all previous experimentations, particularly those of Rutherford.

The method employed was to establish a permanent fistula from the gall-bladder, the track of which was opened from time to time for the experiments. The authors lay stress upon this, as they

claim for the method advantages over the cannula in the estimation both of the normal flow and that under medication. In confirmation of the statement of Rohmann the infliction of the biliary fistula has been consistent with the preservation of good health in the animals if only fat is withdrawn from the diet.

Bile itself, Prévost and Binet find to be the most powerful cholagogue, whether given in the natural state or in the form of a dry extract. If this be true, and it is only confirmatory of what many other observers have asserted, a good deal of doubt is thrown upon the conclusions of Rutherford, since he, believing the ingestion of bile to have no influence over the secretion of bile, actually used it as a vehicle for many of the drugs with which he was experimenting. Bile is also toxic in sufficient doses subcutaneously, and will produce death with symptoms of collapse. The intestine higher up is found, post-mortem, full of bile; lower down, full of a diarrhœic matter, often bloody; sometimes the urine is bloody.

The following substances these observers have found to increase the flow of bile :—

Group I. Urea (in a single instance, accompanying severe gastro-intestinal trouble), oil of turpentine, and terpene. (On the supposed action of *ol. terebinthinæ* on the biliary secretion, is based the treatment of biliary lithiasis after the method of Durande. The present observers find that turpentine and its derivatives produce a “notable” increase in the secretion.) Chlorate of potassium, which also has long possessed reputation as a cholagogue, increased the flow by once or twice the normal. Further, benzoate and salicylate of sodium, salol, euonymin, and muscarin used subcutaneously increase the secretion two or three times the normal amount.

Group II. Substances producing only a slight or doubtful and inconstant increase are: alkaline salts, Carlsbad salts, propylamine, antipyrine, aloes, cathartic acid and rhubarb, *hydrastis canadensis*, *ipecac*, and *boldo*. Thus, cathartics and the alkaline salts, which Rutherford considered cholagogue in non-cathartic doses, these observers found lacking in any such power.

Group III. Substances diminishing the secretion: Iodide of potassium, calomel, iron and copper, atropine and strychnine. In regard to calomel, the writers have not been able to confirm Rutherford, who believed that what cholagogic action calomel had was owing to the transformation into corrosive sublimate. The

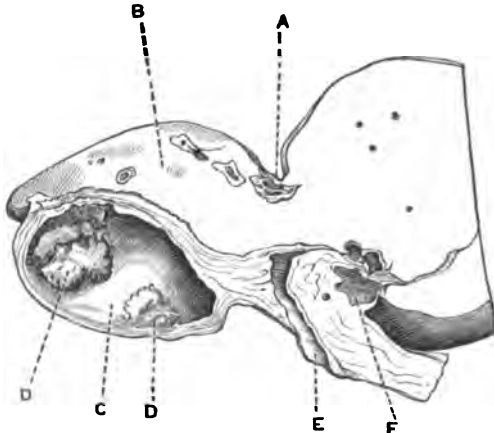
last-named substance given by itself produced no increase. In regard to the elimination of drugs through the bile, the conclusions of the observers are that it is unimportant, the quantities being so small. It is interesting to note that they found ox-bile present in the bile of a dog which had taken it. There is no constancy between the elimination of a substance in the bile and the effect of the same on the activity of secretion. The subject appears to have been particularly well studied and the paper and its conclusions deserve attention.

Treatment.—Finally, this subject suggests the only novel measure in the treatment of catarrhal jaundice which has of late been developed—viz.: the method of Krull,⁴_{p.189,37} which consists simply in the rectal injection daily of one to two pints of cold water, at first of a temperature of 12° R. (57° F.), then of 13° to 15° R. (59° to 65° F.). The fæces became colored in the second to the fourth day and general symptoms rapidly improved. Lowenthal, who some years ago⁴_{p.180,36} employed this method in forty-one cases, speaks highly of it, usually finding that four injections were sufficient. Pregaldino, Kraus, and Eichorst praise this plan of treatment, as do also Parmentier, Hayem, and Chauffard. The latter physician states that ordinarily the stools are clay-colored for from four to six days. By the use of the injections the natural color is obtained in two days, and this return of color is accompanied by a critical polyuria and azoturia.

GALL-STONES.

Reference has already been made to the influence of tight lacing on the secretion of bile. Marchand⁶⁹_{Mar.22} observes that gall-stones and lacing furrows of the liver are very frequently coincident. The lacing furrows have been studied with reference to the gall-ducts, and as a rule are found to have a course obliquely across the right lobe of the liver, from which there is a tendency to atrophy of various degrees in the region of the gall-bladder. In the higher degrees, in which a true lacing lobe is formed, the gall-bladder remains entirely on this part of the right lobe, and the thinned portion of the liver is just at the region of the neck of the bladder and of the cystic duct. It is not infrequent in such cases to find the gall-bladder tightly distended and extending far beyond the border of the liver, and in these cases stones are frequently found.

Stagnation of the flow of bile has been held to be one of the most important causes of gall-stone formation, though it is extremely probable that there is a chemical change in the bile that plays an important part. Anything that may cause thickening of the bile, occlusion of the bile passages, faulty evacuation, especially when the bile is thick and rich in solid matters, leads to the formation of nuclei upon which stones are easily formed. Anything which exerts pressure on the bile passages, especially on the cystic duct, may be considered as favoring the formation of biliary calculi. Pressure on the border of the ribs may exert such an influence. Tight lacing induces pressure of the borders of the ribs upon the liver during the day, at night there is no pressure, or much less, and



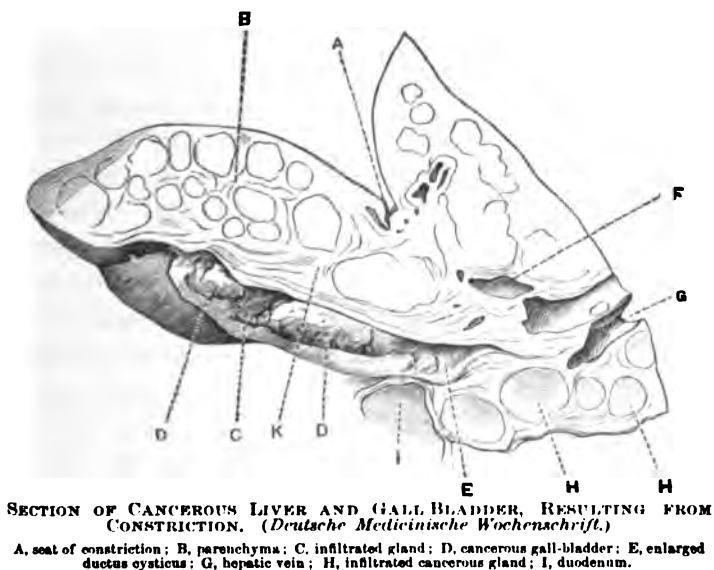
SECTION OF CONSTRICTED GALL-BLADDER. (*Deutsche Medicinische Wochenschrift*.)

B, showing constriction at A, and interior, with cancerous growths at C and D; E, ductus choledochus; F, portal vein.

then only when the tight lacing has changed the form of the thorax. This intermittent pressure, Marchand claims, actually favors stagnation of bile and the formation of concretions in the gall-bladder; it becomes distended during the day and cannot completely empty at night. He thinks the first and most frequent cause of the formation of gall-stones is of a mechanical nature, and in the numerous cases that occur in women he thinks the mechanical factor is tight lacing. He remarks that even cancer of the gall-bladder may be attributed to tight lacing, and illustrates the manner in which the liver is compressed by cuts from actual preparations of cancer of the liver with biliary calculi.

Apropos of the influence of pressure on the bile-ducts, a more salutary example of pressure is furnished by Harley,⁶⁴⁵ who has devised and successfully demonstrated a simple plan of expelling biliary concretions of all kinds, sand, gravel, and gall-stones not bigger than small hazel-nuts, from the gall-bladder as well as from the bile-ducts by regulated firm pressure on the distended gall-bladder through the abdominal walls, and has related several most

instructive cases in which he successfully performed the operation, from one to two hundred gall-stones having been found in the stools after a repeated application of the process. Jonathan Hutchinson² has confirmed the statement of Ord that attacks of gall-stones are often not attended by jaundice. The cardinal symptoms, according to this writer, are minor attacks of pain more or less sudden, such as are often called spasm of the stomach, but jaundice may be wholly absent, even in severe cases and where the stone is large. I have often noticed that the pain has been compared to a grip of the hand, which is felt when the stone is yet in the gall-bladder and not fully engaged in the duct. The sudden relaxation of this grip



should the stone slip back into the gall-bladder has also been compared to the relaxation of the grip of the hand. This spasmodic pain, with or without vomiting, is very characteristic. Dr. Ord has also stated, and is supported by the great name of Jonathan Hutchinson, that gall-stones, far too big to pass through the common duct, and which can, therefore, only pass into the bowel by the formation of an ulcer of communication, do escape by that process without producing very severe symptoms, either general or local. He adds: "I have several times known stones of very large size, big enough to quite plug the bowel for a time, to be got rid of by patients who had never been seriously ill, the only symptoms

having been slight tenderness over the part with slight paroxysms of pain." Dr. Ord has reported glycosuria as occasioned by gall-stones, and further believes that pneumonia may be induced by a transference of arterial hyperæmia from liver to lung, by cold, by disorders of venous circulation, even as in advanced diabetes pneumonia may become a complication. He also reports two cases of severe hæmorrhage associated with the passage of gall-stones. The latter often coexist with malignant disease of the gall-bladder and parts adjoining, and this fact justifies the speculation as to how far the presence of gall-stones would be capable of causing malignant disease.

S. Lamb⁹_{Oct. 6} reports finding forty-two gall-stones about the size of small peas in the gall-bladder of a girl (mulatto) fifteen years old who had died of typhoid fever.

Clément²¹¹_{Sept. 29} reports the discharge of biliary calculi through the umbilicus of a patient suffering from hepatic colic.

Treatment.—The experiments of Touatre, recorded in the last issue of the ANNUAL, who was cured of biliary colic from gall-stones by taking olive-oil, have been tested by Chauffard,²_{Nov. 24} who found after taking oil liberally an immediate amelioration of the symptoms, and evacuation after seven or eight hours of a large number of concretions of a green color and semi-solid consistence, of various sizes, from a pin-head to a small nut. They were soft and resisted the action of water, and it was these, no doubt, that had been taken for real calculi by the first observers of this treatment; but a chemical analysis by Villejean showed that they held but a small proportion of cholesterine, and were formed of neutral fats and free fatty acids.

A very simple experiment, indeed, proved that they were not biliary calculi, as a real calculus placed in olive-oil for a long time remained unaltered. Experiments made upon animals and cadavers by Chauffard also showed that the oil did not go up the ductus choledochus nor the cystic duct, and could not soften the calculi. The conclusion is that the method causes a discharge of certain products and so gives relief to the patients; but it does not soften the real calculi, although some few came away with the soft matters; but this would happen with any purgative. Cantani, of Naples, used to try the oil by giving immense rectal injections.

Petit⁶⁷_{July 30} insists on the rôle of the liver in the pathogeny of hæmorrhages, and the benefits of revulsion over that organ. He reports seventeen cases mostly examples of hæmorrhages from hæmorrhoids, from the nares, and from the lungs, in which the application of a large fly-blister over the liver promptly and effectually arrested the hæmorrhages.

DISEASES OF THE LIVER IN CHILDREN.

Silbermann¹⁵⁸_{Id. S. H. 4} has published an article on "Icterus Neonatorum," with a full record of the literature of the subject and a large collection of the opinions of various authors upon the etiology of the same, with a critical review of them, together with original observation and experiments on the subjects. To speak broadly, there are two theories on this question—the one, the hæmatogenous theory, ascribing the jaundice to the destruction of numerous red blood-corpuscles, is held by Virchow, Porak, Epstein, and many others.

The other, the hepatogenous, which is held, among others, by Frerichs and Schultze, is that the passage of bile into the blood is dependent upon the diminished blood pressure in the portal venous system which is found after birth. Silbermann, whose views are more in accordance with the latter theory, summarizes his opinions, the reasons for which are expounded at large in the course of the paper in the following propositions: Icterus neonatorum is an icterus of absorption, and is therefore hepatogenous in character. The stoppage of the bile takes place in the biliary capillaries and intertubular ducts, which are compressed by the distended portal vein and blood-capillaries of the liver.

This stoppage is caused by a change in the circulation in the liver, which occurs soon after birth, and is a local effect of the general change in the blood-plasma.

This change in the blood is of the nature of a fermentation. The weaker the infant the more pronounced is the jaundice. The destruction of numerous red blood-corpuscles provides plenty of materials for the formation of the biliary coloring matter, which, under the influence of the fermentation, is slow in making its way into the vessels of the liver.

An excellent *résumé*⁵¹_{Id.} of the recent views concerning this subject and its relations to sepsis may be found reported by Currier.

Under the title of "Cirrhoses of the Liver," the results of the study of enlargement of this organ in children has been mentioned. A case of primary cancer of the liver in a child three years old was reported ⁸²_{Jan. 14} to the St. Louis Medical Society.

TUMORS OF THE LIVER.

Hydatid Cysts.—In the last issue of the ANNUAL the progress of the treatment of hydatid cysts was very fully considered, and nothing additional has been determined. In Australia a cure seems generally effected by aspiration, or, failing in this, by drainage through an opening made by a trocar and cannula, and yet treatment by incision and even by abdominal section is not at all uncommon. Among English surgeons the general opinion seems to favor the practice of cutting down on the cyst, stitching the edges of the sac to the abdominal wall, and evacuating its contents. Loreta, of Bologna, ³³⁶_{Sept. 15} has excised the affected portion of the liver, the patient making an excellent recovery. An interesting case of suppurating hydatid cyst occurring in the Presbyterian Hospital, in Philadelphia, is reported ¹_{Apr. 7} by Kintzing and Lord.

It has long been known that bile is destructive of these parasites, and cases have occurred of spontaneous cure in which the opening of the growing cysts into a bile-duct has secured the entrance of bile and the consequent arrest of growth and atrophy of the hydatids. Mercant ²¹¹_{July 15} has related the case of a woman who had a painful hydatid tumor in the leg, which had resisted all previous treatment. He injected the sac with a six per cent. solution of beef-bile mixed with an equal part of water. The contents of an entire gall-bladder was used; after three injections all the hydatids with their enveloping membrane were evacuated.

Echinococcus Cysts.—Baccelli ²_{Nov. 3} reports the successful treatment of two cases of echinococcus cysts after aspiration of a portion of the contents of the sac and the injection of a weak solution, two to one thousand of corrosive sublimate. Others have preferred weaker solutions, such as two drachms (8 grammes) of a one in five thousand solution.

Cysts.—Cystic formation in the liver, although reported in at least a dozen cases, is still sufficiently rare as to make the case reported by Kennedy ⁶_{Aug. 22} of special interest. The ill-health of the

patient arose from cystitis, and the case had been regarded as one of cystic disease of the kidneys. The general appearance of the liver at the post-mortem was nearly normal, except that in parts it showed moderate chronic congestion; and that spread throughout were small cysts, most of them about the size of a pea, one being as large as an orange. With the microscope there were discovered here and there interlobular small-celled growths, apparently the origin of new bile-ducts. Dilated bile-ducts with endothelial cells and secretion inclosed could also be readily found. One cyst was procured complete in section and lay between the artery and vein. It had evidently originated from the junction of several spaces, at first separate from one another, which from the examination of specimens appeared to be portal spaces. In one part of the walls of a duct, in front of a dilatation, fibrous thickening was discovered, and offered a possible explanation of the origin of the dilatations or little cysts. The cysts were lined with a cubical epithelium. The presumption from the above-mentioned facts was that the cysts in this liver arose from dilatation of the bile-ducts.

Sarcoma.—G. Wilson³⁶_{Apr.} showed a liver weighing over eighteen pounds which had practically attained that size in six weeks before the death of the patient. On microscopic examination it was seen to be a melanotic sarcoma infiltrating and almost totally destroying the liver tissue. The patient had had a melanotic sarcoma of the eye removed some time previously, and at the post-mortem the other eye was found to be similarly affected.

Gumma.—A case of rupture of gumma in the liver is reported,⁶_{Feb.} in which, on autopsy, the liver was found large and congested, and presented on the upper surface of the right lobe a large superficial gumma the size of a walnut, situated one inch from the anterior margin of the organ; the capsular covering had given way over the gumma, which showed deep bile staining, with partial disintegration of its surface. The abdominal cavity contained a few ounces of a dark bile-stained fluid, the intestines were covered with recent lymph, and there was general and extensive peritonitis.

EMBOLUS OF THE LIVER.

Three interesting cases of emboli formed of true hepatic tissue have been reported.³²⁶_{Apr.} The first case was that of a railroad employé who was crushed between two cars and the liver rup-

tured. At the autopsy the right auricle was found to contain a brownish-red mass, which proved to be liver tissue. The piece was of irregular shape, three to five centimetres long, about three broad, and two centimetres thick, weighing thirty-five grammes. Its upper surface was uneven and covered with numerous particles of liver tissue. In the right ventricle was a similar piece a little larger, caught between the anterior papillary muscles and the anterior wall of the ventricle. Smaller pieces were found between the trabeculæ. The left ventricle contained an oval piece of liver tissue about the size of a bean. The foramen ovale was not closed and was permeable to a medium-sized finger.

The whole pulmonary vascular system contained embolic masses of liver tissue, but more in the vessels of the right lung; the main branch to the right lung was completely plugged. The renal arteries also contained liver emboli, even in the left kidney, and other emboli were found in the vessels in other parts of the body. This case is especially interesting on account of the patent foramen ovale through which the embolic material reached the left heart.

A case is recorded⁶¹_{July}, in which an embolus from the iliac vein passed through the foramen ovale into the Sylvian artery, in a woman thirty-five years old. Litten has also recorded a case in which portions of a thrombus of the right heart passed through the foramen ovale into the right iliac artery. Schmeidel's second case was that of a man who had fallen four stories and was taken up dead. The liver was ruptured, but there was no injury to the vena cava inferior. Imgens and von Recklinghausen have reported cases of liver-tissue embolism. Von Zeuker reports in the same journal a case of gunshot wound of the liver and heart with liver-tissue embolism.

DISEASES OF THE PANCREAS.

CYSTS.

In the last issue of the ANNUAL the subject of cystic formation in the pancreas was very fully considered. The accompanying table will represent the literature of the subject. It includes the eighteen cases of cysts of the pancreas thus far reported:—

DISEASES OF THE PANCREAS.

Cysts of
Pancreas.]

Literature.	Sex and Age.	Cause.	Duration.	Place of Development.	Symptoms.	Complications.	Diagnosis.	Method of Operation.	Result.	Cyst-contents.
1. Gross, Anatomical Museum of Boston Society for Med. Improvement, 1847, p. 174.	M. 40 years		15 years	Head of pancreas.	Loss of strength, bloody stools.	Icterus.				34-40 grms. serous, bloody fluid.
2. Salter, Zeitschr. f. Heilk., 1886, Bd. VII, p. 11.	F. 42 years		12 years	Tail of pancreas.	Growing tumor.	Icterus.	Ovarian cystoma.			450 grms. thick, almy, yellow, almy fluid.
3. Boesman, N. Y. Med. Rec., 1882, vol. xxi, p. 46.	F. 41 years		7 years	Near the tail.	Pain in right iliac, anastomosis, swelling of the abdomen on left side.		Ovarian cystoma.	Extirpation of the pediculated cyst.	Healing in 36 days.	10 litres brown fluid.
4. Kulenkamp, Berlin klin. Wochenschr., 1882, 13 Febr., No. 7.	M. 39 years	Trauma	6 months.		Tenderness in epigastrium.		Echinococci of the liver.	Incision (2 temps) drainage.	Healing in 6 weeks.	1½-2 litres clear fluid.
5. Dixon, N. Y. Med. Record, 1884, vol. xxv, p. 304.	M. 42 years		11 weeks.	Head of pancreas.	Sudden pain in epigastrium, vomiting.	Icterus.		Puncture and aspir. of the fluid.	Death 5 weeks after operation.	About 300 grms. light-yellow, almy fluid.
6. Penn, Journal of the American Med. Association, Sept. 28th and Oct. 3d, 1885.	M. 19 years	Trauma	5 weeks.	Tail of pancreas.	Pain, vomiting, anastomosis, tumor.		Cyst of the pancreas.	Incision (1 tempo) drainage.	Healing in 7 weeks.	5-3½ litres slight opalescent fluid.
7. Salter, Zeitschr. f. Heilk., 1886, Bd. VII, p. 11.	F. 33 years		11 years.	Tail and body of pancreas.	Backache, vomiting, tumor in epigastrium.		Ovarian cystoma.	Extirpation of cyst.	Death 6 days after operation.	3 litres yellowish-brown clear fluid.
8. Kramer, Centralbl. f. Chir., 1886, p. 23.	F. 16 years		Several weeks.		Abdominal pain, tumor in epigastrium.		Echinococci of the liver.	Incision (1 tempo) drainage.	Healing in 4 months.	2 litres clear fluid.
9. Kott, Curatio in Pan. krasnyes, Lang. Diss., Marburg, 1896.	F. 36 years		8 years.	Tail of pancreas.	Enlargement of abdomen.		Ovarian cystoma.	Partial excision.	Death in 7 weeks.	2½ litres brown, thick fluid.
10. Kruener, Deutsche Mediz. Wochenschr., 1887, No. 10, p. 189.	M. 46 years		6 months.		Periodical gastric pains, loss of weight, tumor under right costal arch.		Cyst of the pancreas.	Incision, tampon.	Healing in 6 weeks.	2½ litres clear, yellowish fluid.
11. Gubbelo, Allgem. Wiener Mediz. Zeitung, 1887, Bd. 32, p. 279.	M. 20 years		3 years.		Colic-like pains, vomiting, tumor in epigastrium.		Cyst of the pancreas.	Incision (2 temps) drainage.	Healing.	2 litres turbid, brownish fluid.
12. Kiesel, Archiv f. klin. Chir., 1885, Bd. xxiii, p. 304.	F. 45 years		9 years.	Tail and body of pancreas.	Tumor in epigastrium.		Ovarian cystoma.	Extirpation of the cyst.	Death 96 hours after operation.	10 litres brownish fluid.
13. Fries, Wiener Mediz. Presse, 1861, No. 45.	F. 36 years		2½ years.	Tail of pancreas.	Tumor in epigastrium.		Ovarian cystoma.	Partial excision.	Death 10th day.	5 litres brownish fluid, albumen, cow serratia.
14. Thiersch, Berl. klin. Wochenschr., 1881, Bd. xviii, No. 40, p. 591.	M. 38 years		1 year.	Tail of pancreas.	Took suddenly sick, tumor in region of the stomach.		Abscess of abdominal wall.	Incision (2 temps) drainage.	Healing in 12 weeks.	3 lites chocolate-colored fluid.
15. Quensenbeyer, v. Langenbeck's Archiv f. klin. Chir., 1885, Bd. xxix, p. 385.	M. 40 years		11 weeks.		Took suddenly sick with vomiting and gastric pain, anastomosis, epigastric tumor.		Cyst of the pancreas.	Incision (1 tempo) drainage.	Healing in 12 weeks.	1900 grms. grayish-black fluid.
16. Bull, N. Y. Med. Journal, 1867, Oct. 1, p. 576.	M. 45 years		10 months.	Tail (?) of pancreas.	Sudden pain, vomiting, dyspnea, loss of appetite, emaciation.	Icterus, diabetes.	Cyst of the pancreas.	Incision (2 temps) drainage.	Recovery. Death later from diabetes.	118 ounces dark-brown fluid.
17. Fenger.	M. 8 years	Trauma	11 weeks.	Tail of pancreas.	Tumor in epigastric region.		Cyst of the pancreas.	Incision (2 temps) drainage.	Healing in 3 months.	40 ounces straw-colored fluid.
18. Stenck (not fully reported yet)	M.			Tail of pancreas.	Tumor in epigastrium.		Cyst of the pancreas.		Recovery.	

Steele²³¹_{Apr. 10} reports one case of traumatic origin—at least it was noticed a few months after a severe contusion of the body and compression of the pancreatic region between cars.

CANCER OF THE PANCREAS.

Bard and Pic⁹²_{Apr. 10} have recorded seven cases of primary cancer of the pancreas, on which they have based the following conclusions: The patients are usually past middle life. Jaundice generally sets in gradually, occasionally suddenly, and once present it never disappears, but increases in intensity. It is accompanied by digestive troubles of various kinds. The gall-bladder is distended. The tumor may sometimes be felt against the vertebral column in the situation of the pancreas. All the signs of biliary retention are present. Cachexia and emaciation are well marked and progress rapidly. Hæmorrhages occasionally occur. The onset of the disease is frequently characterized by the sudden development of gastric disturbance, with vomiting or diarrhœa, followed by jaundice. The liver is generally small and hard, rarely slightly enlarged, never “mammillated,” as in secondary hepatic cancer. Epigastric or dorsal pain is a fairly constant symptom. The vomited matter is never bilious. The stools are often fatty. The urine is almost always more or less albuminous and occasionally contains sugar. The temperature is habitually subnormal. The duration of the disease is short.

In addition to the preceding observations the authors conclude (1) that primary cancer of the pancreas presents histological characters proper to that organ, in direct relation with the cellular types which normally constitute the gland; the most frequent form is that of epithelial cancer of the glandular type; secondary cancer nodules generally occur in the liver, presenting the same characters; (2) the compression of the bile-ducts sets up changes in the liver resembling biliary cirrhosis. Secondary cancer of the pancreas differs radically from primary cancer, this structure varying according to the nature of the original neoplasm.

Cancer of the head of the pancreas is therefore a disease without distinct pathognomonic symptoms, but the following points seem to be additional diagnostic symptoms:—

1. An abdominal tumor in pancreatic region.
2. The presence of fatty matters in the dejections.

3. Deep-seated pain more or less acute and continuous in epigastrium.

4. Marked cachexia and emaciation, pointing to the presence of malignant disease.

In Dickinson's opinion¹⁸⁷ cachexia is always present in cancer of the head of the pancreas, the color being usually dusky grayish green. Moore⁴⁰⁶ reports a considerable number of cases, finding that jaundice occurred in all those cases where the new growth appeared to be primarily in the pancreas, but out of a series of twenty-four cases of secondary growth in the pancreas jaundice was found in seven cases. Reference has been made to the presence of fatty matters in the stools in the article on hepatic diseases. There is special aversion to fatty foods when the pancreas is diseased, but the presence of fatty matters in the stools is by no means a constant or reliable symptom.

Ira Van Gieson⁵⁹ has recorded some microscopical specimens illustrating fat-necrosis in the pancreas. The specimens were taken from a woman aged eighty. In the superior border of the pancreas, about midway between the head and tail, was a soft, yellowish-white nodule, about five milligrammes in diameter, having a degenerated, pasty centre. In the tail of the organ was a similar superficial nodule the size of a pin's head. A portion of the soft centre of the larger nodule, examined microscopically in the fresh condition, consisted of larger and smaller, rather opaque, globules, some of which stained with osmic acid. In sections through the nodules, amorphous masses were seen in places partially filling up the fat-spaces; in other places the degenerated fat-cells had coalesced, forming irregularly shaped necrotic masses, which stained brightly with eosin. The lesion seemed to be produced by the coalescence of necrotic fat-cells. Some of the acini of the pancreas contained hyaline cast-like bodies surrounded by the compressed cells of the acinus. Fat necrosis has been studied by Ponfick, Chiari, and Balzer. The latter author found the lesion present in the pancreas in five instances in twenty-five autopsies, and recorded a case in which the lesion occurred in the omental fat and extensively in the pancreas, which was the seat of fatal hæmorrhage. Balzer is disposed to think in this case that the fat-necrosis, by producing the pancreatic hæmorrhage, was the indirect cause of death.

Pisenti ²¹¹_{Aug. 12} experimented on dogs and determined the amount of indican in the urine and found it to vary between 11.7 and 19.9 milligrammes. He then tied Wirsung's duct, and after a transitory increase found it reduced to 4.34 milligrammes.

Trower ²_{Sept. 22} has recorded a case of primary scirrhus of the pancreas with some very interesting symptoms. A sailor aged forty-five suffered for three years from bronchitis, asthma and dyspepsia. In March, 1886, he came under treatment for a peculiar condition of the backs of the hands. On the right hand there were three bullæ, two of one inch, and one of half an inch in diameter; on the left was one bulla of two inches in diameter. All the bullæ were circular, situated on thickened and inflamed bases and containing flaky serum, and after persisting for about five weeks disappeared, leaving raised, warty cicatrices, the skin not becoming natural till about ten weeks after their first appearance. He was laid up in July with loss of appetite, great thirst, epigastric pain and occasional vomiting, a thickly coated tongue, and constipated bowels; he was passing a great quantity of pale urine, specific gravity 1002, containing no albumen; there was no hæmatemesis or melæna. He was said to be losing flesh. Malignant disease was suspected, but no tumor could be felt. After treatment, with rest in bed and very careful dieting, for about a month, his condition improved considerably and he began to get about a little, though he still suffered from severe pains in the epigastrium. At this time his right leg became white, swollen, and œdematous, but recovered after a few days' rest and treatment.

In the following October the symptoms, as described in July, returned with renewed violence, the epigastric pain being very severe and described as dragging and tearing him in half; he could retain no solid food and liquids only in very small quantities; the vomit contained much bile; he was anæmic and slightly jaundiced, and was increasing in bulk from accumulation of fat. The liver was now found to be very much enlarged, extending four inches below the ribs and into the left hypochondrium. The pulse was feeble and rapid and the heart-sounds weak. The urine, normal in quantity and of specific gravity 1003, contained no albumen. The symptoms increased, and he died the second week in October, after an attack of hæmatemesis. Necropsy disclosed scirrhus of the pancreas without secondary involvement of any other organ.

Pemphigus, such as apparently existed in the hands, has been noted in degeneration of the liver and spleen and in wasting diseases. The remaining chief features of interest were the phlegmasia and the great accumulation of fat. Phlegmasia is not uncommon in deep-seated cancer. Trousseau regarded it as an important symptom. Fatty accumulation might readily occur, as the chief office of the pancreas is that of emulsifying fat, so that increase of fat might be a valuable symptom in recognition of pancreatic disease. No mention of this symptom, however, is to be found in any recorded case.

Kuhn⁵⁰_{May 22} has placed on record the history and post-mortem examination of a two-year-old female child that was affected with this disease. When the child was brought to him it was anæmic and troubled with constant diarrhœa. It had been ill for several weeks before this time. Syphilis and other infectious diseases were absent. Physical examination revealed anasarca, slight bronchitis, general anæmia, stools yellow or rather brown in color, lymphatic glands and spleen not enlarged. Before death the stools became colorless and watery. Death ensued from pneumonia. The post-mortem revealed carcinoma of the pancreas, with a metastatic deposit in the lower lobe of the left lung. Dr. Kuhn concluded that the morbid growth must have commenced during foetal life, as the disturbance manifested itself in the first year of its existence, after which the pancreas began to act more positively on the digestive organs. The dropsical appearance was caused by the pressure of the tumor on the venous circulation of the liver. The secretion of the bile was diminished by the fatty degeneration of the liver. There was no jaundice.

A truly unique case—primary sarcoma of the pancreas—has been described by Dr. Litten.⁴¹_{Oct. 22} When the patient, a boy four years of age, was first examined by a physician no symptoms could be elicited except some occasional relaxation of the bowels and pain on pressure in the abdomen. Two weeks later the boy presented very great emaciation, although his bodily weight had increased eight or ten pounds. The abdomen showed, even on superficial inspection, a well-circumscribed tumor with hard borders and nodes. The rapid emaciation and enormous growth indicated a malignant neoplasm, the true character of which could not be defined during life. The boy died in a few days, and the autopsy revealed a

sarcomatous growth of the pancreas, filling out the entire abdominal cavity. The tumor, on microscopic examination, was found to consist of small cells. The case is quite noteworthy, as no primary sarcoma of the pancreas has hitherto been described in medical literature.

In a clinical study Segré¹³_{Nov. 15} found, in eleven thousand four hundred and ninety-two cases followed by autopsy, one hundred and thirty-two tumors of the pancreas—one hundred and twenty-seven carcinomas, two sarcomas, two cysts, one syphiloma. In the one hundred and twenty-seven cases, twelve occurred without involvement of other organs.

Segré showed in the following table the relation of pancreatic carcinoma to carcinoma of the other abdominal viscera, based upon his eleven thousand four hundred and ninety-two autopsies:—

	Cases.
Stomach (œsophagus, 39; cardia, 10; pylorus, 72; stomach-walls, 56),	263
Pancreas,	127
Intestines (duodenum, 4; small intestine, 2; colon, 7; cæcum, 6; rectum, 17),	44
Liver,	130
Kidneys,	21
Peritoneum,	37

DISEASES OF THE INTESTINES AND PERITONEUM; CHOLERA.

By W. W. JOHNSTON, M.D.,
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DIARRHŒA.

THE custom of speaking of diarrhœa as a disease is followed here, although much erroneous pathology and still more irrational treatment results from such a method of treating the subject. Diarrhœa is nothing but a symptom of many varied conditions which differ in many respects from each other, and which require different modes of treatment. This review is limited, therefore, to features that are more or less common to all forms, or to special varieties of diarrhœa.

Nothing will illustrate better the importance of regarding diarrhœa as a symptom than a consideration of it as it occurs in connection with chronic intestinal indigestion in children, in gouty adults, and in overtaxed states of the nervous system. Each of these conditions requires an appropriate but different system of diet and a different medication, but in all a routine treatment of the symptom by astringents and opiates is hurtful in the extreme.

The presence of micro-organisms on the digestive tubes and the bearing which they have on pathological processes is developed in an article by Roger.¹⁰⁰ The number of gastro-intestinal micro-organisms is not definitely determined, one estimate placing them at forty-two billion nine hundred and sixty million. Bierstöck has isolated five bacilli; one transforms hydrocarbons into alcohol and has no action on albumen; another, the *bacillus putrificus coli*, changes albumen into peptones. Brieger adds three more to the five of Bierstöck, two of these having digestive properties. Vignal has distinguished ten varieties, all having influence on digestion. In newly-born children there are no intestinal parasites, but they appear soon after birth, even before food has been taken. Besides the physiological functions of the microbes in digestion, they lead to the development of toxic agents, which, under certain circum-

(D-1)

stances, are abnormally increased, as in sausage poisoning cases, two hundred and sixty-three observations of which have been collected by Müller. The food taken is filled with micro-organisms which find in the intestines excellent conditions for their development; absorption of the poison with infection of the system are the results. It is probable that fermentation in the intestines, due to the putrefactive influence of micro-organisms and the subsequent absorption of a poisonous principle, will explain many pathological phenomena.

The association of chronic diarrhœa with œdema of the lower extremities is explained by Rendu¹⁰⁰ as due to implication of the nervous system through impaired nutrition of the nerve-centres and consequent vasomotor paralysis.

Pochl⁶ has examined the urine with a view of estimating the amount of intestinal putrefaction. Albuminoid decomposition in the intestines gives rise to the formation of sulphuric acid ethers in the urine, and they become a measure of the extent of intestinal decomposition.

Treatment.—To prevent and cure morbid states, such as those described above, Roger¹⁰⁰ considers intestinal antiseptics as the remedy. A good intestinal antiseptic should be slightly soluble, very active antiseptically, and not itself poisonous. Naphthol, naphthaline, iodol, and salol are suggested, the first and last answering these requirements best. Bouchard recommends the formula:—

R Naphthaline,
 Sugar, ss 3 ½ (2. grammes).
 Essence of bergamot, gtt. 2 (0.13 gramme).
 M. Div. in powders no. xxv.
 Sig.: One every hour.

In the treatment of diarrhœa in general the following substitute for Racahout may be used⁹:—

R Powdered chocolate (pure), ½ lb. (248 grammes).
 Rice-flour, ½ lb. (248 grammes).
 Powdered sugar, ½ lb. (248 grammes).
 Tannin, ¼ oz. (8 grammes).
 M. Sig.: A tablespoonful to be cooked in milk for half an hour.

Powdered talc (silicate of magnesia) is recommended by Debove¹⁶⁴ as an efficient remedy for chronic and especially for tubercular diarrhœa. He has given as much as two hundred to six hundred grammes (six and one-half to nineteen and one-third

ounces) in milk daily. Arsenite of copper, one one-hundredth grain (0.00065 gramme) given in divided doses so that this quantity can be taken in the course of three or four hours, has been found serviceable ⁶⁰_{Sept.} in acute gastric intestinal catarrh with vomiting and cramps.

Hill Diarrhœa.—In an article on this subject, Surgeon-Major D. Barry ²⁰⁶_{July} gives the predisposing causes of the disease as follows: (a) altitude alone, through the frequent changes of temperature and liability to chills; (b) women suffer less than men, and children are almost exempt, due probably to the fact that the liver in them is larger, more elastic, and better able to bear the excess of function when the action of the skin is interfered with by chills; (c) insanitary conditions of camps after prolonged occupation. The exciting causes are chilling of the surface and excesses in food or drink.

Chronic Tropical Diarrhœa.—As found in those who have lived in India, this is well described by Sir Joseph Fayrer. ³⁶_{Sept.} He considers it a general derangement of all, rather than a specific disease of any one organ. There is a thinning of all the coats of the small intestine, so that they become translucent, with atrophy of the glandular tissues. The mesentery, mesenteric glands, liver, spleen, and kidneys are atrophied in long-standing cases. The most effective treatment is dietetic, milk alone being most serviceable; great attention should be paid to the clothing and mode of life; drugs are of little use.

ACUTE DYSENTERY.

Etiology.—Chantemesse and Widal ⁵⁵_{Apr. 21} have studied in the laboratory of Cornil five cases of dysentery contracted in the tropics. They discovered a micro-organism in the fæces, in the wall of the large intestine, mesenteric glands, and spleen. This micro-organism is a bacillus with rounded ends, slightly swollen; it develops rapidly in gelatine and other culture media at an ordinary temperature; under cultivation its transverse diameter increases; it has very little movement, and is slightly colored by aniline. In sterilized Seine water it grows rapidly. Guinea-pigs fed with the pure culture show no effect for a few days. If killed in eight days, the stomach is ulcerated; the mucous membrane of the large intestine is swollen, ecchymosed, ulcerated, and the closed

follicles are hypertrophied, as well as the mesenteric glands; between the tubular glands a large number of bacilli are seen penetrating and forming groups in the submucous tissue. The liver shows yellowish foci, and in the centre of the portal spaces, and in adjacent capillaries are bacilli, like those which had been injected. Intraperitoneal injections of the bacillus produced death in two or three days, due to peritonitis, pericarditis, and fibrinous pleurisy.

The presence of this bacillus in the stools and viscera of dysenteric patients, its absence from the stools of healthy individuals, and the lesions which it seemed to cause in the organs of the guinea-pig are arguments in favor of the bacillary origin of the disease.

Trasbot,⁸_{Sept. 12} reviewed before the Academy of Medicine, an article of Mathis on a dysenteric affection in puppies which often killed them in a few days. It is the same disease as enteritis occurring in calves and lambs. Mathis isolated the germ, cultivated it, and reproduced the disease in healthy animals, but the observation is incomplete and lacks confirmation.

An epidemic of dysentery at Toulon was studied by Bertrand,¹⁹⁵_{May to Nov.} and a full report is made of its history, etiology, pathological anatomy, symptomatology, etc. From May 20th to November 1st there were two hundred and twelve cases: in May, one; June, six; July, fifty-seven; August, sixty-two; September, fifty-three; October, twenty, to which are to be added thirteen cases developed in the hospital; of these nine died, or 4.20 per cent. The conditions which accompanied this outbreak were a high temperature in the last of July and August, 33° C. (91.4° F.) and even 35° C. (95° F.), and lower temperature in September and October; moderate rainfall; the soil contained various micro-organisms; exposure to the foul air of a sewer conveying faecal matter (the water of the sewer was found to contain micrococci and bacilli); the potable water was pure; there was chilling of the patient in thirty-seven cases; excessive fatigue in others. Several of the cases were convalescents from typhoid fever and from tropical dysentery; thirteen cases developed the disease in hospital, notwithstanding careful disinfection of stools, utensils, etc. Two persons engaged in chemical examinations of the stools had dysenteric symptoms. The mildest cases

lasted about ten days, those more severe nearly three weeks. The stools contained various micro-organisms, micrococci, streptococci, bacilli, staphylococci, ten varieties in all. Bertrand concludes that the staphylococcus pyogenes albus or aureus is a constant element in the stools of severe cases. Experiments with the cultured germ failed to produce any effect when introduced into the cæcum of a rabbit or when swallowed by a dog. Ptomaines were found in the stools. Not one case of liver abscess occurred. Suppurative peritonitis without perforation was found in one case. Several times typhoid fever immediately succeeded the dysenteric attack, and such cases have, usually, severe intestinal hæmorrhages. The number of red globules in the blood were diminished. The absence of fever was noted in cases of each variety, the mild and severe.

Paralysis in Dysentery and in Chronic Diarrhœa of Warm Countries.—Pugibet⁹² reports three cases with sudden development and early improvement (three, thirteen, and twenty-three days' duration). The peculiarities of the paralysis were: (1) it was less and less complete in going from the centre toward the periphery; (2) improvement was in the inverse order from the extremities toward centre; (3) muscles most completely paralyzed were the last to be cured; (4) paralysis was not always complete, frequently paresis only. There was complete paralysis of the extensors of head, of arm at shoulder, incomplete of forearm and of fingers. The paralysis was symmetrical on both sides of neck and trunk and in both upper extremities. Other symptoms noted were paresis of right trapezius and right rhomboid, paralysis of bladder and rectum, neuralgia of trifacial, anæsthesia of trifacial and of both auditory nerves with deafness. The author discussed the question whether the seat of paralysis was in (1) muscle, (2) nerves (neuritis), (3) of reflex origin (visceral irritation), (4) of cerebral origin, negatived by absence of cerebral symptoms, (5) or of spinal origin. He came to the conclusion that it is a lesion of the anterior cornua of the cord. In several cases paraplegia is the typical form of paralysis; the symptoms are like those in acute myelitis of the anterior portion of cord. There was an absence of disturbances of sensibility. The disappearance of the symptoms and their mildness in many cases show that the lesion is a temporary one, probably anæmia of the cord, due to the general impaired nutrition, to loss

of blood, or to reflex contraction of the vessels of the cord from dysenteric ulceration.

Treatment.—Correspondents continue to give favorable reports of their experience with rectal treatment. Large enemata of hot water or ice-cold water are said to relieve tenesmus and diminish the number of stools. An enema of two to three pints (one to one and a half litres) of water, with one-half to one drachm (1.94 to 3.88 grammes) of alum to the pint, once in twenty-four hours, through a soft-rubber tube, introduced one foot into the bowel, gives comfort for the next twelve hours.⁸⁰ Antiseptic irrigation is in great favor; ice-water, one pint (one-half litre), with ten grains (0.65 gramme) of salol, every two to six hours (Campbell⁸⁵), or one or two enemata of eight grains (0.52 gramme) of naphthalin in three ounces (one hundred and nine grammes) distilled water (Hinterhof⁵⁷¹) are methods recommended. Fluid extract of ipecacuanha, thirty to fifty drops in two or three drachms (eight to twelve grammes) of water, every six, twelve, or twenty-four hours, combined with tincture of opium if not retained, is a method of administering this specific remedy. Surath Lal Boru²⁰⁶ reports favorably on the aconite treatment of dysentery—one minim (0.065 gramme) every half hour for eight to ten hours, then one minim every hour; an early change in the character of the stools is noted. The bichloride of mercury and salol internally has received recommendation from various quarters. The treatment employed by Bertrand,¹⁹⁵ in the Toulon epidemic, was as follows: For mild cases a purgative of manna in milk or sodium sulphate was given on the morning of the first day, and in the evening a rectal injection of warm water with boric acid. On the next day and afterward an infusion of fifteen to thirty grains (one to two grammes) of ipecacuanha was administered by enema, or a solution of nitrate of silver was injected into the rectum every day or every other day. When the stools improved, extract of rhatany was given by enema. In cases of medium intensity manna or sodium sulphate until the stools become diarrhoeal, with an opiate at night to produce sleep. In bloody discharges ipecacuanha in full doses, by the mouth, for three or four days, later manna in milk until the stools improved, when bismuth was given or injections of extract of rhatany to complete the cure. In the severest forms the same treatment as in the last form if it could be borne,

with injections of nitrate of silver and hot hip-baths. In feeble persons the purgatives were given in smaller doses, with injections of nitrate of silver and claret and water. In chronic dysentery John D. T. Reckett²⁰⁶ recommends nitrate of silver injections with a long rubber tube and funnel, using three pints (one and a half litres) of warm distilled water, with sixty grains (four grammes) nitrate of silver in solution, this to be retained five minutes, and repeated every day until better.

SUBLIMATE COLITIS.

Virchow²² presented to the Berlin Medical Society a specimen of the disease, involving the whole of colon and a great part of the small intestine. A woman, aged twenty-five; abortion at three months; vagina washed out with one to five hundred sublimate solution, and a little of same solution used for irrigating the uterus. Later, washed out with a one to five thousand solution; rigor immediately after; two hours later, diarrhœa and vomiting; the following day anuria, collapse, and death. Colitis as above stated, and advanced parenchymatous degeneration of the kidneys. He also alluded to the case of a young man, whose wound after a surgical operation was washed with a one to two thousand sublimate solution. The same symptoms as in the above case followed. The lesions were also the same.

MEMBRANOUS ENTERITIS.

Etiology.—Cornil¹⁴² considers all forms of pseudomembranous enteritis to be due to special micro-organisms introduced with food, their difference in intensity being due to the amount of virus introduced, the susceptibility of the patient, and the hygienic surroundings. The differences are not owing to different anatomical lesions, but to differences in the nature of the micro-organisms. Certain forms of diphtheritic inflammation of the large intestine are due to the use of mercury in some form in the treatment of wounds, etc., and, according to Fränkel,⁶⁹ such results are more likely to occur from its application on those portions of the body where absorption takes place most rapidly. The consensus of opinion is that in the form of membranous enteritis most frequently seen the pathogenesis of the affection is to be looked for in the nervous system.

Naturally, the *diagnosis* is made from the appearance of casts

or shreds in the stools, though they are not found in each stool passed during a paroxysm. Kilbourne^{59 Feb. 18} states that they are smooth, grayish-white in color, vary in thickness from that of tissue-paper to blotting-paper, and on examination possess no traces of organization, and give no reaction to the agents for detection of albumen or fibrin, but appear to be mainly mucous in character. Sir Andrew Clark states that there are three varieties of diseased mucous membrane: 1. A clear, jelly-like, and imperfectly membranous substance. 2. Yellowish, semi-opaque, flaky, and usually membranous. 3. Yellowish-white, dense, opaque, distinctly membranous, tough, and rather adherent to subjacent surface.

The *prognosis* as to cure is essentially bad, although death from this disease is rare; most cases run a protracted course, some intercurrent disease causing the death of the patient.

Treatment.—In the treatment of this affection diet, regimen, and hygiene are of main importance, easily digested or predigested foods, exercise in the fresh air, and proper attention to the normal functions of the various organs being paramount. During the attack, according to Edwards,^{5 Apr.} opium is indicated for the relief of pain, and many other agents are strongly recommended by various authors. Kilbourne^{59 June 16} says the pain is often relieved by hot fomentations. Maurel^{67 Sept. 30} has obtained most happy results from lavage of the stomach. He urges that complications should always be sought for, and stomach complications stand first in importance; when found they should be treated as though they existed alone. In the complications he found lavage, with either an acid or alkaline solution, the best form of treatment, and after the gastric symptoms are relieved the intestinal lesion should receive treatment without regard to the previously existing complications. The lavage is to be made with a tepid solution, repeated every two days, and continued until an improvement is noticed.

TYPHLITIS, PERITYPHLITIS, ETC.

Pathology and Diagnosis.—The questions at issue in regard to the pathology of inflammatory conditions of the cæcum and appendix vermiformis have been fully discussed during the year. The current of opinion and experience give to the appendix the important place formerly held by the cæcum as the starting point and seat of perforating lesions. The position of the appendix,

with its frequent malpositions and adhesions with neighboring organs, and the narrowness and tortuousness of its canal, in which foreign matters are so easily retained, show how readily inflammation may be excited in it. Lesions of the appendix have frequently been found where death has taken place from other causes, and Kraus claims that between the ages of twenty and seventy years every third autopsy will show disease of the appendix. The statement of Gulach that in elderly people the valve at the outlet and a second valve-like projection are atrophied, and that this is the reason why perforation is comparatively rare after forty years, is not borne out by experience, as among recently recorded cases some were over this age. The appendix is probably not without a function. Whether it is merely a secretory organ for lubricating mucus or the source of a special digestive or antiseptic secretion is not yet known, but that it has a part to perform we may well believe. In a certain number of fatal cases of perforating appendicitis (28 per cent.) no foreign body was found in the canal. A catarrhal condition of the lining membrane of the appendix, associated with cæcal catarrh, would not lead to graver lesions unless it appeared in an intensely aggravated form. Symptoms of recurring inflammation of a subacute or chronic character sometimes suddenly change to those of acute inflammation, ending in the destruction of the wall of the appendix; so that, leaving out those cases where the foreign body may disintegrate or be lost in the cavity of an abscess, there are still some which are not connected with this cause.

The onset of inflammation from a mechanical irritant, usually a fæcal concretion, is much more common. At what point in its history the foreign body begins to excite inflammation cannot be told. It is probable that localized peritonitis and serous or seropurulent accumulation within intraperitoneal cavities may take place before perforation occurs, although, even when early operation has been performed, perforation or sloughing of the appendix has been found. The main difficulties in diagnosis involve the decision as to perforation, its probable occurrence, or the chances of recovery without operation. A comparison of an equal number of cases of inflammation in the cæcal region ending fatally without operation and of recoveries without operation, which occurred during the past year, will bring out some points of contrast. In

sixteen fatal cases the ages ranged from ten to fifty-nine years ; three were over fifty years. In the recoveries the youngest was thirteen years and there were six under sixteen years. The remaining ten were adults. The symptoms in the sixteen *fatal cases* were (mentioned in the order of frequency): Pain in the right iliac fossa, fever, tympanites, constipation, tenderness on pressure, vomiting, a tumor in the right iliac region appearing from the third to the seventh day. Acute mania occurred in two cases. Death resulted in from the third to the eighth day. The lesion found was inflammation of the appendix, with perforation in fourteen cases and sloughing of the entire end in two cases. The point of perforation was near the cæcum, at the centre or at the distal end of the appendix. General peritonitis was found in eight cases, encysted peritonitis in three, and local peritonitis in two cases. A foreign body in the appendix, or escaped outside, was said to have been seen in eight cases. There was a pyæmic abscess of liver in one case and phlebitis of the portal vein in one case.

The *symptoms* in the sixteen cases of recovery, without operation, were abdominal pain, fever, a tumor in the cæcal region, appearing from the third to the seventh day ; tympanites, increased sensibility to pressure, constipation, vomiting, and rigidity of the recti muscles. The mode of recovery was by a discharge of pus from the bowel (three cases), discharge of pus into the pleural cavity and paracentesis (one case), discharge of a membranous slough (one case), by resolution (eleven cases). The treatment followed was rest, fomentations, opiates, and saline purgatives. In five recoveries after operation the symptoms were the same ; the majority were in adults, the operation not being performed before the sixth day ; the latest was the eighth. Incision with drainage was practiced in three cases, incision without drainage in one, and removal of the appendix in one case. There is no case of fatal typhlitis, except three of perforation of the cæcum noted by McMurtry. The symptoms in the cases which recovered and those which died without operation were the same, the difference being that in the former improvement began at a certain date, and in the latter there was a steady progression toward the fatal result. As inflammation and destruction of the wall of the appendix occurred in all of the *fatal cases*, the question is, What was the lesion in the *non-fatal* ones ? We have no reason to say

that the lesion was not in the appendix, the symptoms being the same as in those cases in which the post-mortem showed the appendix to be the starting point of the disease. It is reasonable to believe that perforation did not occur in the recovered cases, but that inflammation of the appendix was the cause of the symptoms. It may be that catarrhal inflammation, not due to the presence of a foreign body, and followed by localized peritonitis and effusion of serum, is the disease in cases ending in recovery, as distinguished from the perforating lesion and more intense, or more general, peritonitis in connection with the presence of a foreign body in the appendix. Biggs,⁵⁹ concludes, after an examination of nearly two hundred cases, that in a very large proportion of cases of general peritonitis following ulceration and perforating the appendix, the condition was the result of the impaction of a large foreign body in the appendix that extended freely into the peritoneal cavity, having a long mesentery and being easily movable. A movable appendix is very favorable to the expulsion of a small continued foreign body, but not unfavorable if this body cannot be expelled. With a movable appendix adhesions do not readily form; general peritonitis quickly follows perforation. Fitz,⁶⁰ in commenting upon Sand's views, reiterates his opinion that if the abdominal cavity is examined in the first week of fatal cases there is almost invariably found a purulent peritonitis, circumscribed, or diffused, or both. If circumscribed, the condition is commonly called a perityphlitic abscess, the walls being formed by adhesions between the parietal and visceral peritoneum. The canal of the appendix generally communicates with the cavity of the abscess by a perforation of the wall. There is rarely any evidence of pus in the subperitoneal connective tissue.

Treatment.—If we were guided by the results of the operations and post-mortem examinations we should say, as Fitz asserts, that typhlitis, perityphlitis, perityphlitic tumor, and abscess mean inflammation of the vermiform appendix, that the chief danger of this affection is perforation, that perforation in the great majority of cases produces a circumscribed suppurative peritonitis, tending to become generalized; that in the light of our present knowledge the surgical treatment (operation in the first week) offers the best chances for the life and future health of the patient. But, as has been shown in this review, so many cases recover after all the

typical symptoms of the disease have been presented, that we may well feel that we have, so far, no assured guide as to which cases do and which do not require surgical interference. As long as the disease is mild, with a tendency to improvement in all the symptoms after the third day, no abscess being discovered by physical examination, surgical interference is not justifiable. If there is evidence of pus, or if the patient is daily growing worse after the third day, an exploratory operation should be performed before the end of the first week or as soon before this as the symptoms demand, the operation to be continued to the end if pus is demonstrated to be present, or abandoned if no pus is found. In all cases where general peritonitis exists, laparotomy should be performed. In acute rapidly progressing cases, even when no pus can be discovered, an exploratory incision should be made.

An interesting case presenting symptoms of inflammation in the cæcal region is reported by Helmuth.⁵⁷ There was pain following the development of a tumor above Poupart's ligament on the fifth day. On tapping with a fine trocar, a large quantity of pus escaped. The cavity of the abscess was irrigated with a 2 per cent. carbolized solution and a drainage tube inserted. On the fourth day afterward, on exploring with a probe, a foreign body was removed, and found to be a small satchel-key. A case of perforating ulcer of the cæcum with local peritonitis is reported by McMurtry.⁸² The edges of the ulcers were trimmed and closed with Lembert sutures. The patient recovered.

In the published notes of cases by Osler there are three of perforating ulcer of the cæcum; in the first the abscess communicated with a localized abscess in the iliac fossa; in the second with an abscess-cavity between the caput coli and the psoas muscle, and an ulcer on the posterior wall; in the third case the colon was strictured and the wall had broken through; there was a large abscess which extended behind the psoas muscle. These are interesting and rare cases.

ULCER OF THE DUODENUM.

Etiology.—Maurice Letulle,⁸³ attempts to show the infectious origin of the stomach and duodenal ulcer. He produced ulceration of the stomach of guinea-pigs by injections of pure cultivations of dysentery, and with the staphylococcus pyogenes aureus.

Diagnosis.—An interesting case was reported by Planchar^d, bearing upon the diagnosis of duodenal ulcer. The patient, four years before death, was in the service of M. Bucquoy, suffering from violent pains in the region of the pylorus and gall-bladder, extending from front to back, and with vomiting of blood and bloody stools. Three months before death he entered the hospital again, suffering from violent pain in the same locality. He was put on a milk diet, with morphia to relieve the pain. Rapid improvement ensued, and he was able to do some work. Suddenly taken with symptoms of acute peritonitis, he was brought to hospital, and died in thirty-six hours. At the autopsy a general peritonitis was found, due to perforation of a duodenal ulcer, situated on the anterior surface very near the pylorus; evidences of cicatrization of the mucous membrane around the ulcer was seen, and it was evident that the ulcer was an old one which had undergone a partial separation.

W. Robbin^s showed a specimen from a patient of middle age, who had suffered from dyspepsia and intense pain for a few days only, below the edge of the liver; a perforating ulcer of the duodenum was found below the pylorus.

Ivan Svensson and Wallis report a case of ulcer of duodenum with obliteration of common bile-duct and cystic duct, intestinal catarrh, closure of bile-duct, and distention; fluid drawn by aspiration and fixation of gall-bladder to abdominal wall. Death by exhaustion. Autopsy; ulcer in duodenum corresponding in site to opening of bile-duct. Inflammation of cellular tissue set up by the ulceration; no communication between cystic and hepatic duct; escape of bile into intestine entirely prevented. (Report of F. Eklund, corresponding editor, Stockholm, Sweden.)

Two interesting cases are reported by Osler.⁵⁰ Case I. Dyspepsia, hæmatemesis, and melæna for eighteen years. Frequent attacks of hæmorrhage from the bowels without vomiting of blood. Severe pain three or four hours after eating, in a line from the ensiform cartilage to the left ileum. Case II. Since 1869 dyspepsia and occasional attacks of gastralgia. In 1882 slight melæna without vomiting, and since then repeated attacks of gastralgia. The writer argues, from what is known of duodenal ulcer, that these cases present a sufficient number of the characteristic symptoms to justify the diagnosis, but believes that although

melæna alone is a valuable localizing index there is still much uncertainty in the recognition of duodenal ulcer. I reported a case⁵_{July}, which had the accepted typical symptoms of duodenal ulcer, especially melæna, syncope, and persistent pain in the duodenal region. Since this publication the patient has continued to improve, but has passed blood from the bowel two or three times. The ulcer is no doubt cicatrizing.

FOREIGN BODIES IN THE INTESTINES.

A child, two years old,⁵⁹_{Mar. 10} swallowed twenty-three buttons, each one-third inch in diameter; he was given bread only to eat for two days, when they were all passed in the centre of a hard fecal mass. Among other cases cited in which a large number of articles were swallowed, one child is mentioned who had swallowed forty-two rifle-balls, which were found next day in his fecal evacuation; another swallowed a large-size diaper-pin, which was passed per rectum without causing any trouble. Malony²_{July 14} reports the case of a carpenter who swallowed a two-inch nail. He was given large doses of hydrochloric acid with the object of forming a soluble salt of iron; the movements for several days were blackened, pain and tenderness gradually subsided, and he is now apparently well. MacLagan²_{Jan. 27} reports two cases of temporary obstruction due to the lodgment of biliary calculi in the intestines.

RUPTURED INTESTINES.

In many cases of rupture of the intestines the symptoms are almost pathognomonic, but other instances of abdominal injury may present many signs of intestinal rupture and yet recover, the shock being due to the sympathetic nervous system, the diminished liver dullness to the disturbed intestines. In cases where rupture is suspected, Robson⁶_{Feb. 18} states that exploration by a small median incision should be made, when, if there is any rupture of the bowel, flatus or serum tinged with blood or feculent material will escape, and then the incision may be enlarged and necessary treatment be adopted; but if there is no escape of either, the wound may be closed, as no harm will have been done. In all cases of doubt an exploratory incision should be made.

INTESTINAL PARALYSIS.

Ewald⁴_{Jan. 22} reports a case of intestinal paralysis following general

paralysis, complicated with a complete twisting of the large intestine and a great displacement of the intestines. The twist was in the colon, and a vast accumulation of fæcal material lay between it and the cæcal valve, thus hindering its passage either way. An old yellowish deposit was found in the right corpus striatum and in the great path of the optic thalamus. His question was, Which first existed, the paralysis or the twisting?

TUMORS OF THE INTESTINES.

Cancer.—Picque⁷_{Dec. 77} reports a case which presented all the signs of intestinal strangulation, viz.: swelling of stomach, absence of all stools, frequent fæcal vomiting, anxious countenance, and cold extremities, the point in doubt being the nature and location of the obstruction.

The patient having suffered with her stomach for four months without the symptom of occlusion, narrowed down the diagnosis to either a neoplasm or tubercular peritonitis, the last hypothesis being negatived by the absence of all abdominal induration and signs of pulmonary tuberculosis. An artificial anus was made on the right side rather than the left, on account of the probable location of the lesion. Unfortunately, the cæcum could not be found, and enterotomy was performed on the knuckle of small intestine, which presented itself in the wound, drainage being well established. The stomach was rapidly flattened.

The interesting feature of the case is the location of the lesion in the small instead of in the large intestine, notwithstanding the breadth of distention of the abdomen, which is considered by standard authors as characteristic of lesions in the large intestine.

Fürbringer³_{Jan. 88} reports the case of a man suffering from ascites, in whom, after being tapped, many irregularities on the surface of the liver were noticed, and the case was supposed to be carcinoma of the liver, complicating a carcinoma of the peritoneum. At the autopsy the liver was found perfectly normal, but there was cancer of the peritoneum; the irregularities of the surface were due to the carcinomatous omentum.

Lymphoma.—A case of a lymphoma of the intestines is reported,²_{Feb. 88} in which the symptoms simulated biliary colic.

A peculiarly sudden fatal termination is reported by Mercer⁸⁹_{Mar.} of a case in which no symptoms presented themselves of any disease

until within less than twenty-four hours before death from intestinal hæmorrhage due to tumor of the ilium. On post-mortem examination a vascular myoma ten centimetres in diameter was found attached by a pedicle to the ilium; a small oval opening in the mucous lining of the ilium corresponded to the attachment of pedicle, and from this undoubtedly the fatal hæmorrhage occurred. There were old and extensive adhesions of the intestines and peritoneum, both kidneys were reduced in size, the tubuli and pelvis filled with pus, the liver was fatty and friable, and the uterus a mass of fibroid tumors.

INTESTINAL OBSTRUCTION.

The great importance of the question of the diagnosis and treatment of intestinal obstruction is attested by its extensive literature. Early in the year Stimson¹_{Feb. 26} read a paper on the pathology and symptoms of the various forms of intestinal obstruction before the Medical Society of the State of New York, and a committee was appointed to ask for communications on the subject from the physicians of the State.

Symptoms and Diagnosis.—Fitz, in the discussion on the medical relations of "Acute Intestinal Obstruction," at the Congress of American Physicians and Surgeons,⁵⁰_{Sept. 22} reviewed the question of diagnosis and treatment, including peritonitis. A case with pain, vomiting, tympany, and tumor as symptoms would be an intussusception, a twist of the large intestine and strangulation, or gall-stones in the small intestine. The differential diagnosis depended on the relative frequency of these varieties, the age of the patient, the antecedents, and the immediate symptoms. The treatment consisted in the effort to relieve intussusception of the large intestine by forced injection under anæsthesia, by massage, and by treating obstructing gall-stones with opium, laxatives, and electricity. The other forms require surgical treatment. Fitz, in a very valuable contribution, has collected a series of three hundred and five cases from English, German, and French literature since 1880; they are divided as follows:—

Strangulation,	.	.	.	.	.	101	cases, 34 per cent.
Intussusception,	.	.	.	.	.	93	" 32 "
Abnormal contents,	.	.	.	.	.	44	" 15 "
Twists and knots,	.	.	.	.	.	42	" 14 "
Strictures and tumors,	.	.	.	.	.	25	" 5 "
						305	" 100 "

Intussusception, with the passage of a portion of the intestines twenty-nine inches long on the fifteenth day, occurred in a woman aged fifty-six years.⁸⁶ The patient recovered slowly, but died six months afterward from exhaustion. A stricture of the bowel was found, probably at the point of the intussusception, and there were many adhesions. An example of the causation of intussusception by polypus within the intestines was reported by Van Bibber.¹⁰⁴ According to Leichtenstern's statistics, a polypus is found in thirty out of every six hundred cases. Welch, in demonstrating the specimen, spoke of the position of the polypus near the top of the entering layer of intestine as affording proof of the correctness of Nothnagel's views as to the mode of production of intussusception. The increase in the invagination was experimentally proved by him not to be due to a descent of one portion of the intestines within the other, but to the drawing up of the receiving layer through contraction of the longitudinal muscular coat, the layer being gradually drawn over into the returning layer, and the latter in turn being transformed into the entering layer.

Intussusception of the ilium developed intrauterine and subsequently intestinal atresia. H. Chian⁸⁸ thinks that a case like his has not before been described. The birth was normal. The child, a male, at first appeared well. After nursing it soon vomited, this being regularly repeated. It was noticed that no meconium was discharged. On the fourth day it refused to nurse but still continued to vomit. The abdomen was very tender and lightly touching it caused retching. Emaciation was rapid. Death occurred on the seventh day, ushered in by general convulsions. The body weighed 225 grammes (seven ounces), a loss of eight hundred and seventy grammes (twenty-eight ounces) since birth. Stomach and small intestine, excepting fifteen centimetres of the lower extremity of the ilium, much dilated. Lower end of ilium and large intestine completely contracted. The dilated stomach and intestine contained gas and sero-mucus tinged with bile. The contracted parts had a scanty quantity of reddish mucus. The mucous membrane of the upper parts was swollen and red, of the lower quite pale. The cause of this condition was a complete intestinal atresia fifteen centimetres above the ileocaecal valve. Apparently this was due to the absence of a portion of intestine, and the corresponding mesentery had a convex base 4.5 centimetres in length, fairly

smooth, and had formed only slight adhesions at the ends of the pervious intestine. Peritoneum and mesentery were otherwise normal. The atresia inspected from below showed a funnel-shaped cavity in the centre, in which the serous coat of the intestine could be traced. It was impervious to a sound. The intestine laid open on its convexity disclosed an intussusception four centimetres in length. It was very hyperæmic; no necrosis. He explains the total obliteration of the intestinal lumen in the manner that the intestinal spasm at the upper end of the intussuscepting part constricted the innermost lamella. Secondly the outer lamella of the intussusception lengthened itself at the expense of the inner. The length of the former was four, of the latter one centimetre. This lesion must have occurred at least some weeks before birth. An explanation of the absence of meconium is not attempted. Wylie²¹³_{Apr} reports the case of a woman pregnant six months; had symptoms of intestinal obstruction with pain; a well-defined prominence in the ilcocæcal region. Purgatives were given and on the fourth day a large quantity of hard fæces were passed. Later the stools became offensive, puriform, and bloody, and in one a piece of sloughed bowel was passed. The patient continued to pass blood, but improved from this date, and finally recovered, giving birth to her child at the proper time.

Sedgwick⁶_{Feb. 11} reported a fatal case of obstruction, with perforation of the cæcum, from strangulation of the gut, by an elongated Fallopian tube which was adherent to the ileum and duodenum. Two cases of constriction of the intestines by a vitelline duct are mentioned.⁹⁰_{Jan} Both were operated on, one in eighteen hours after acute symptoms began, with successful result; in the other the operation was done later, the patient dying. Rectal obstruction was found, in a case of Makins,⁶_{May} to have resulted from a rare cause, namely, caries of the fifth lumbar vertebra and extensive ulceration of the perinæum. All the pelvic organs (the patient was a woman) were displaced or adherent from inflammation. Colotomy was performed, but death ensued soon after. There were no symptoms of caries except the perinæal ulcer.

The absence of symptoms indicating intestinal obstruction in cases which rapidly prove fatal is exemplified in a report by Whittlesey.⁵⁰_{Mar.} A child, two years of age, was slightly ill for three days. The bowels were not moved by purgatives, but there were no

serious symptoms. On the fourth day there was a sudden collapse with great distention of abdomen. The child died in five hours after first appearance of urgent symptoms. Fourteen inches from the ileocæcal valve the small intestine was caught and constricted by a diverticulum about one inch in length, springing from the ileum, and attached to the posterior wall of the pelvis.

A case of fæcal accumulation is reported by Beck,²⁷¹ in which large quantities of fæcal matter were removed, and yet the patient died. The ileocæcal pouch, the ascending and a part of the transverse colon, the latter having a diameter of five and one-half inches, were distended with fæcal matter. There was no stricture.

Worrall,⁵⁰ reports a very interesting case of a large fæcal accumulation occurring in a girl aged thirteen years. A rapidly growing abdominal tumor was not diminished by purgatives, and as the patient was sinking an exploratory laparotomy was done. On opening the abdomen the tumor was found to be a fæcal mass in the cæcum and colon. Nothing further was done, as the bowels began to act, and in six days the tumor had entirely disappeared. The operation seemed to have a stimulating effect on the bowel in producing expulsive contractions. Impaction of the rectum with water-melon seeds, one quart of which were removed by injections, is reported by Ricketts.⁵³

Wilson,² reports the case of a boy, aged seven years, who had acute intestinal obstruction, due to the impaction in the rectum of large quantities of hazel-nut shells, forming a mass as large as two fists, which were removed with some difficulty. A woman, aged twenty-nine years, under the care of Perry,²¹⁶ had frequent attacks of violent pain in the left inguinal region. Stercoraceous vomiting followed. Large enemata of warm water were given and inverted suspension tried, and as the patient was failing, an exploratory laparotomy was performed. What proved to be a large ovoid-shaped enterolith was found in the ilium, about ten inches from the valve. This was removed by longitudinal incision and the wound stitched. Death occurred the following day of pulmonary œdema. The enterolith weighed three hundred and seventy-five grains; length, two and one-fourth inches; circumference, one and one-fourth inches; diameter, one inch. A case of obstruction of the gut by lumbricoids at the end of the ilium was correctly diagnosed by Taylor,²²⁴ who based his opinion on the presence

of a soft and elastic tumor in the region of the ilium and the exclusion of typhlitis by the absence of tenderness, and of the great forms of obstruction by the absence of symptoms of shock. Large warm-water enemata repeated every six hours brought away on the third day thirty-five lumbricoids. In another case of the same kind reported by Stepp,³⁸⁵_{Nov. 27} a boy, aged four, who died with symptoms of acute obstruction one hour and a half after medical aid was called, forty or fifty lumbricoids were found in a mass above the cæcal valve, thirty-five more were in the ilium, and a few were in the stomach and œsophagus. In a case treated by Long,¹²¹_{May} a supposed accumulation of *honey-comb* in the bowel produced serious symptoms of obstruction in a farmer, who had eaten largely of honey. Free irrigation of the bowel and a mild purgative caused the evacuation of a substance resembling honey-comb and relieved the symptoms.

A case of obstruction due to scirrhus of the sigmoid flexure, which almost closed the lumen of the intestines, is reported by Taylor.²²⁴_{Feb. 16} A cylinder-celled carcinoma was found by Bennett,⁶_{July 14} surrounding the cæcum in the case of a man, aged sixty-nine, who had been ill for three weeks, suffering from abdominal distention and constipation. Two cysts of the jejunum were found by Buchwald,⁶⁹_{Nov. 40, '97} in the case of a boy, aged six years, who had died after resection of the intestines with the tumors attached. The cysts were connected with the walls of the intestines, but did not communicate with the tube. A similar stricture of the sigmoid flexure, so narrow that a probe only could be passed, was met with by Boyce, no motion having occurred for nine weeks. The stools were never ribbon-shaped; on two occasions the intestines were punctured for excessive distention with no bad results. The long rectal tube failed to reach the point of constriction.

Treatment.—The cure of intestinal occlusion by galvanism has been advocated by Laret.³_{Aug. 29} The intestinal pole is represented by a mass of salt water injected into the rectum. Into this a sound, properly protected, is passed, the other electrode being placed over the abdominal wall. He had complete success in ten out of sixteen cases. Monod¹⁶⁸_{Apr. 5} had a similar experience with galvanism. Distention of the intestines by carbonic acid gas, thrown into the rectum by Bergeon's method, gave immediate relief to a case with the symptoms of acute intestinal obstruction in

the practice of Givré.²¹¹_{July 22} The injection of large quantities of warm water has produced favorable results in a case of acute intestinal obstruction treated by Boyd.²⁸⁵_{Mar. 16} G. Brambilla⁶¹⁶_{Nov. 21} reports four cases of intestinal obstruction relieved by irrigation. In one case a woman of sixty had acute obstruction, lasting two days and cured after the introduction of 1.5 litres of warm water, with the expulsion of two enteroliths. The larger was 2.5 centimetres long, cylindrical, smooth, white, and fatty to the touch. Its extremities were brownish white. Its centre contained a brown nucleus surrounded by six layers of deposit of alternating white and yellow colors. The other stone measured one centimetre by seven to eight millimetres, and had a similar structure. The nucleus of these concretions was supposed to be gall-stone, and the covering phosphates and carbonates with cholesterin and fat.

DILATATION OF THE LARGE INTESTINE.

At a meeting of the Clinical Society of London,²_{Feb. 4} cases were reported by members illustrating the excessive distention to which the colon is liable. In one the sigmoid flexure formed two large sacs extending across the abdomen (Money). In another case of extreme constipation the sigmoid flexure measured twelve inches in circumference (Hadden), and in a third there was formed great dilatation of the cæcum (Duckworth). The President, Dr. Broadbent, referred to two cases, the one of congenital distention of the sigmoid flexure (which filled the whole abdomen), the other was a great dilatation of the transverse colon, associated with chronic constipation.

The danger of puncture of the intestines through the abdominal wall for excessive symptoms, are pointed out by Curtis.¹_{June 5} He states that in laparotomy operations the puncture of the bowel by fine aspirating needles to lessen the amount of distention has been seen to be followed by the escape of gas and fecal matter, the openings not closing for some time after the withdrawal of the needle. He cites cases to prove this assertion. Ryle⁶_{Apr. 7} reports a case treated by active peristalsis, followed by punctures, in which no serious symptoms followed.

PERITONITIS.

Etiology.—The germ theory of peritonitis, at least, has been pretty well established by the experiments of Pawlowski.¹⁹_{Dec. 21, 77} He

found that non-pathogenic micro-organisms, even when combined with small quantities of a chemical irritant, are not capable of producing peritonitis. His conclusions with regard to pathogenic micro-organisms are altogether different, as these, injected in very small quantities, produced intense fibrino-purulent peritonitis. Murray⁶_{Sept. 1} reports three cases occurring in India in which perforative peritonitis was caused by round-worms (*ascarides lumbricoides*). He felt convinced that the perforations through the gut were made by the parasite and were not the result of ulceration from disease, for the reason that the apertures were circular and ring-like, quite unlike any solution of continuity due to disease, and also because of the healthy condition of the rest of the intestines.

Tubercular peritonitis, secondary to tubercular affections of other organs, according to Cimbali,²⁵_{Aug. 20} is of frequent occurrence, and the discovery of the primary lesion is of great assistance in arriving at a diagnosis; but primary tubercular affection of the peritoneum runs a very obscure course. There are several points, which, though not by any means pathognomonic, are of assistance in leading us to a proper diagnosis, namely, the low temperature, the comparative absence of pain and tenderness in some cases, and copious ascites, with distention of the superficial abdominal veins.

Diagnosis.—In tuberculous peritonitis the curled-up omentum, lying across the abdomen, is often mistaken for a tumor, though it may be recognized by its being more movable than a tumor in this locality, and from being accompanied by night-sweats and rise of temperature.¹¹²_{Oct.} The insidious mode of onset of this form and its difficult diagnosis are exemplified in a case reported by Alamartine,²²⁸_{Sept. 15} where for several months there had been a general peritonitis without attracting the patient's attention. There was no evidence of pulmonary tuberculosis. Death occurred suddenly, a rare termination in such cases, to be explained by reflex influences starting from the abdominal ganglia.

Treatment.—Saline purgation for peritonitis is still highly spoken of by many writers, and a number of favorable reports of successful treatment by this method are cited. Suckling,⁶_{May 12} in a case of peritonitis, due to typhlitis set up by faecal impaction, gave magnesium sulphate and sodium sulphate in half-drachm (1.94 grammes) doses, combined with ten minims (0.65 gramme) tincture belladonna; he considers this treatment of great value in such

cases. On the other hand, Bouchard ¹⁰⁸_{Oct. 15} says he has known of many cases where serious harm was done by the system of purgation. He urges that the main object of treatment is to cause and maintain absolute rest of the intestines, to prevent further infection of the peritoneum, thereby not allowing a simple localized peritonitis to become generalized. For this purpose he uses opium in some form, and restricts or interdicts as far as possible all drinks and food. Nitrate of pilocarpine in one-eighth grain (0.0081 gramme) doses is mentioned favorably by Shearer. ¹⁹_{Aug. 4} Cimbali ²⁵_{Aug. 20} states that the only successful treatment of tubercular peritonitis is abdominal section.

The general treatment is directed toward building up the system, promoting absorption of the effusion, and increasing the nutrition of the body. This is sought to be accomplished by the use of iodide of iron and potassium, small doses of arsenic, and nourishing food. Soft flannel cloths, saturated in tincture of iodine dissolved in castor-oil, applied over the distended abdomen, are suggested by Whitmire. ¹⁴⁹_{Dec. 27}

CONSTIPATION.

Treatment.—A faulty posture at stool is said to be an active cause in producing constipation. In the physiological act of defæcation the individual neither sits nor stands—he squats; every muscle of the back and abdomen is brought into play and the bowel is rapidly and completely emptied. The substitution of a marble slab with a hole in it, at a level with the floor, or the use of the chamber instead of the water-closet, affords a remedy for this objection, according to Williams. ⁹⁹_{Aug. 28}

The use of glycerine as an enema in constipation has received some attention in the last year. Although not a new remedy, having been used for this purpose both in this country and in Europe, attention has been recently drawn to it by the discovery, after various analyses, that the chief ingredient of a celebrated proprietary remedy for constipation, sold largely in Holland and Germany under the name of Oidtmann's *purgatif* was glycerine. Anacker ⁹⁹_{No. 27, 27} demonstrated chemically that glycerine was the active therapeutic agent in this preparation and that in small quantities it was an efficient agent for emptying the bowel. He ascribes its efficiency to the property of abstracting water from the mucous membrane of the rectum and then bringing about hyperæmia and

increased peristaltic action through nervous excitation. Vamossy¹¹³_{No. 36, 37} administered enemata of glycerine to one hundred and fifty cases in doses of 2.5 grammes (thirty-five grains). An evacuation followed in from one to two minutes, the stool being semi-solid and formed, but not fluid. Seifert³⁴_{No. 3} found that one fluidrachm (3.88 grammes) administered by enema acted promptly and did not lose its effect, although used for months. Boas⁶⁹_{No. 23} had the same results. In cases where the enema cannot be used, hollow suppositories, each holding fifteen minims (1 gramme) of glycerine, are said by him to be as successful, acting in from fifteen to twenty minutes. Others have reported their experiences, and while some have not had uniform success, or found the long-continued use of glycerine enemata irritating to the rectum, the general testimony is very favorable. Griffith⁹_{Dec. 3} reviews the subject in full and reports on the remedy as used in two hundred and thirty-four cases of constipation, the amount used being usually one to two fluidrachms (3.88 to 7.77 grammes). The results were most encouraging. In five to ten minutes a full, easy, and painless movement followed. Glycerine suppositories were somewhat less certain in their action, but were generally successful. Glycerine and soap suppositories (holding 90 per cent. of glycerine incorporated with hard castile soap or dry stearine soap) were found exceedingly active.

Hardin²_{Jan. 25} advises an injection of a small quantity of yeast into the rectum in cases of faecal lodgment. In a case of very obstinate constipation, a movement not occurring oftener than once a month, Harley²⁷¹_{Feb.} tried a decoction of tobacco, one drachm to one pint (four grammes to one-half litre), by enema, half of this quantity being injected at once. One repetition was all that was necessary to produce permanent cure. Massage of the colon from right to left, titillating or percussing the anus, are favorably spoken of by Greenley¹⁹⁸_{Aug.}

As a consequence of neurasthenia, irritation of the skin and ice-bags to the abdominal walls are indicated. In constipation from chronic peritonitis and perityphlitis massage has been effective. Cures, as a rule, result in from four to six weeks from eighteen to twenty-five applications.

The efficacy of massage treatment is explained as follows³⁴_{Aug.} :
1. The mechanical effect, the stimulating of the secretion of the intestinal glands, and propelling onward of the intestinal contents.

2. The reflex effect. 3. The rise in temperature of the blood. 4. A chemical action, induced by the accumulation of Co_2 in the veins caused by venous hyperæmia from manipulation. At the same time peristalsis is increased.

According to Bueler the most effective treatment of chronic constipation is massage of the abdominal walls. This does not imply a mechanical, indiscriminate following of the movements directed by various authors, but the massage is to be differently conducted according to the various causes and the individuality of the case. If the trouble is due to deficiency of abdominal tension, deep, powerful massage is indicated in the beginning to arouse reflex contractions of the recti abdominis. If, however, there is atony of the intestinal muscular layer, as those of sedentary habits, slight strokings of the flattened hand is at first sufficient, and finally more energetic manipulations instituted. If dyspepsia be the cause, massage of the epigastric region is of service.

ASCITES.

Notkin⁸_{Nov. 22} made a series of experiments in regard to the absorption of various solutions introduced into the abdominal cavities of animals by examination of urine and lymph for the earliest detection of the solutions so introduced. He discovered that watery solutions appeared in the urine in a very few moments after its introduction into the abdominal cavity, thereby proving them to be at once absorbed by the blood-vessels; while solutions of some coloring matter and the defibrinated blood of dogs was first absorbed by the lymph-ducts and thus reached the blood. He accounts for the continued accumulation of ascitic fluid and its non-absorption by the fact that these lymph-ducts become clogged with blood-corpuscles, thereby preventing this mode of absorption. The fluid not being absorbed is itself an irritant to the serous membrane, thereby causing an increased secretion and an ever-increasing accumulation.

Etiology.—De Renzi²⁵_{Oct. 20} reports a case where ascites was attributed to a varicose condition of the veins of the peritoneum. Chyliform ascites has been said by Terrillon³_{July 2} to be due to rupture of the lymphatics, and in one case Strauss at the autopsy found the lymphatic vessels torn.

Diagnosis.—Some authors assert²⁶_{Jan. 2} that an adipose character

of any effusion (as established by aspiration) points to the presence of a malignant tumor, and therefore a puncture may supply us with an additional diagnostic sign of no small value. Coe,¹_{July 22} demonstrated that the presence of the spouting cell-groups of Foulis was diagnostic of malignant growths, as proven by autopsies. He stated that, while their presence could not always be detected in the ascitic fluid where such growths existed, nevertheless, when they were found it would make the diagnosis clear.

Treatment.—The treatment of ascites by faradization of the abdominal walls is not new, but it is only quite recently that a thorough study of its application and mode of action has been attempted. It is recommended in all forms of ascites from various causes. Though the results have not been curative in every case, they have invariably been followed by improvement in the condition of the patient. One pole of the battery is placed in the lumbar region, the other anywhere over the abdomen, the patient being either in a semi-reclining or reclining position, the current being sufficient to cause slight contractions of the abdominal muscles without pain to the patient. The applications are made two to four times a day and last from five to fifteen minutes. The many theories as to the mode of action of electricity seem scarcely sufficient to account for all the results obtained. Muret⁹²_{Sept. 10} found, in cases where there was great distention of the abdomen, causing intense suffering to the patient, that paracentesis preceding the application of electricity was of great relief, and the fluid was not apt to reaccumulate. To prevent pain in the operation for acupuncture the free use of the ether spray at the point of puncture is recommended by Richardson.⁸⁸_{4 Q. W.} Rivadeneyra⁹_{Feb. 25} applies tincture of iodine in strips, leaving a breadth of clear skin between each, the untouched parts being painted after the skin of the previously painted strips begins to peel off. Chittick²⁸⁴_{Oct.} had good results from the use of strophanthus in eight- to ten-drop doses.

DISEASES OF THE MESENTERY.

Gairdner¹²¹⁹ shows that the old belief that tabes mesenterica is essentially a disease of the mesenteric glands, and that the wasting is due to the obstruction thus caused to the passage of chyle, is erroneous. Such cases are in reality tubercular peritonitis usually associated with general tuberculosis. The types in which it

presents itself on physical examination are: (1) a slight amount of mobile fluid in the abdomen; (2) non-mobile fluid; (3) dullness over the greater part of the abdomen, but with resonance over the stomach, the transverse colon, or in one or other groin; (4) an alternation or succession of the preceding conditions. There is also a preternatural hardness of the abdomen due to thickening of the omentum. The prognosis is not as unfavorable as is supposed. The treatment is dietetic and supporting. Operative interference is not favorably spoken of. A case of fibroma of the mesentery of the size of an infant's head is reported by Péraire.⁷ A serous cyst of the mesentery in a woman of thirty-one years, occupying the left hypochondriac and epigastric regions, was reported by Heine.²² The symptoms were pain, vomiting, and diarrhoea. Trombetta¹⁴ describes a cyst of the size of an orange. The patient died with symptoms of intestinal obstruction. A dermoid cyst of the mesentery was shown to the Berlin Medical Society by Löwenmeyer.⁶⁹ The tumor was said by Virchow to contain parts which could not be classed otherwise than in connection with the respiratory apparatus, and which probably were embodied in the tumor at an early date. There were no teeth found in the cyst.

CHOLERA ASIATICA.

Epidemics.—The last great epidemic of Asiatic cholera is that which raged in Chili from December to May of the years 1886-7. Polakowsky⁶⁶ reviews the valuable publication of the Chilean Government on this epidemic, entitled: "Informe de los Médicos de Lazaretos sobre el Tratamiento del Colera Asiático. presentado à la Junta de Salubridad." Cholera was introduced into South America by an Italian ship at Buenos Ayres in October, 1886. Soon it appeared at Rosario. Military cordons were established, but, proving ineffectual, were done away with. Through the movements of bodies of troops the disease appeared at Mendoza, and with the end of December of this year it was carried through the Uspallata Pass into Chili, finding a favorable soil in the valley of the Rio Aconcagua. Chili, as well as the other States on the west coast, had closed its ports to vessels from the infected harbors of the Argentine Republic; and, further, had its chief mountain passes guarded landward, but ineffectually, as it seems, for a drover, bearing infected old clothing and coming from the Argen-

tine Republic, was the first case. He died the day after his arrival at the village of Villa Maria (one thousand inhabitants). Soon there and in San Felipe (twelve hundred inhabitants) cholera deaths numbered from twenty to fifty daily. During January, 1887, its spread in the Aconcagua Valley was slow and the disease was chiefly amongst the poor, who had used no prophylactic measures. The province was isolated from the southern country by a military cordon. The first case at Santiago occurred in a suburb on January 25th. In January and February cholera raged in the provinces of Aconcagua, Santiago, and Valparaiso. The number of deaths in Santiago on February 2d was sixty; February 11th, one hundred and thirty-six; February 26th, fifty-three. The total mortality could not be accurately estimated, as many bodies were interred in which death certificates were intentionally or unintentionally falsified. Twenty-two thousand, however, may be regarded as a very low estimate.

Etiology.—That the comma bacillus is the cause of the disease is now admitted by all observers excepting a few in England, like Klein and Gibbs. Koch declared the bacillus to lose its vitality on thoroughly drying. Hueppe and others claim to have seen certain granules in the cultures develop into fully formed cholera bacilli. These granules were held to be the arthrospores of the bacillus and to determine whether under any condition or stage of life cultures might be found resisting the effects of desiccation or heat. S. Kitasato, ⁵⁸_{oc.} in the Berlin Institute of Hygiene, made a number of experiments. He could not discover any essential differences in any cultures, nor was he able to see any bacilli developed from the granules. He therefore declares that such granules bear no relation to the growth of the bacillus, and explains the varying results of other experimenters by stating that desiccation was only imperfectly practiced. The ptomaines and toxines resulting as products in cholera cultures present subjects of interest and importance in the pathology of the disease. Brieger ⁴_{44, 57} succeeded in isolating several bodies of important toxic properties. Of these methyl-guanidine is a derivative by oxidation of the pre-existing kreatin of the culture medium. Experimentally it produces cramps. Of two new toxic ptomaines, he was able to obtain very small quantities, but of decided action. The simultaneous formation of cadaverin has a retarding influence on

the growth of the bacillus, and this limits the production of the new bodies. The first principle, $C_8H_8N_2$, like methyl-guanidine, produces cramps. The chemical determination of the second could not be made. It develops in mice an algid stage and diarrhœa. There remains, hence, but little doubt that these bodies are peculiar to the growth of the cholera germ, and that to their action on the affected human economy are due the symptoms of the disease. Cadaverin, also, is not without interest, as Behring⁶⁹ caused death in guinea-pigs by its use, the pathological alterations being very similar to those found in the same animal from the action of the cholera bacillus.

Pathology.—G. Johnson¹¹⁴⁵ advocates his theory of cholera anew. According to him, diarrhœa is not the cause of collapse, which is quite distinct from that due to exhaustion. The poisoned blood, which creates the diarrhœa, also causes contraction of the arterioles of the lungs and finally arrests the flow of blood entirely. This pulmonary block also produces suppression of the bile and urine. Diarrhœa does not cause the blood to become inspissated, which, however great its degree, is still fluid through absorption from the tissues. The thickened blood from the pulmonary block causes a certain quantity of water to escape through the walls of the distended veins and systemic capillaries, in consequence of the increased pressure back from the right heart; probably, also, a filtering action through the contracted pulmonary arterioles allows the thinner parts of the blood to pass onward, whilst retarding the thicker. The consecutive fever is the product of increased oxidation compensating the imperfect oxidation of collapse. The patient becomes collapsed, not because the blood is thickened, but because there is too little in the systemic circulation.

Queyrat and Broca²⁴_{Des. 3, 37} have described an erythema peculiar to cholera, due to the infection and consisting of a fairly red papule with diffused borders two to three millimetres in diameter and slightly elevated. On thick epidermis these papules do not develop, but red spots are seen. After twenty-four hours regular corymbs form, resembling morbilli or beginning scarlatina. Miliary vesicles may surmount the spots. Furfuraceous desquamation follows. The bucco-pharyngeal membrane may also be attacked with a spotted or uniform redness.

Prophylaxis.—Fayrer²²_{v. 1, p. 447} states that meteorological changes

produce sudden alterations in the activity and intensity of an outbreak, and that the rate and direction of an epidemic are not influenced by facilities of communication or by the greatest streams of human traffic. Cordons and quarantine have not only failed to prevent the spread of cholera, but, on the contrary, have done harm. Removal is the best course when cholera attacks a regiment or other body of men, and to travel in an infected region is especially dangerous to a new-comer. That isolation by cordons and quarantine is useless all authorities agree.

Pasteur read a preliminary communication of Garnaleir, of Odessa, before the French Academy of Sciences,¹⁴ on preventive vaccination of Asiatic cholera. Ordinary cholera cultures are so little virulent to animals that it was at first thought they possessed immunity from the disease. If, however, after passing through a guinea-pig a culture is passed into pigeons, they die from dry cholera with exfoliation of the intestinal epithelium. In the blood of such pigeons the microbe is found. Successive inoculations on pigeons intensify the poisonous action, and the poison is now fatal to guinea-pigs. If a pigeon, however, be first protected by a double inoculation (muscle and abdominal cavity) of the ordinary culture it does not succumb to the virus which is most fatal to others. The active virus having been cultivated in bouillon and the bacillus destroyed by a temperature of 120° C. (248° F.), maintained for twenty minutes, a very actively poisonous principle is evolved. Four cubic centimetres of the sterilized infusion destroy a guinea-pig in twenty-four hours with post-mortem gastric and intestinal hyperæmia. Like effects occur in pigeons after twelve cubic centimetres at a single injection. If, however, this quantity is given in divided doses in three to five days, the pigeon survives, likewise the guinea-pig after six cubic centimetres in three injections, and both are proof against the action of the most active cholera virus.

Loewenthal, of Lausanne,¹⁶⁴ believes he has raised the virulence of the laboratory cholera bacillus by culture grown on a solid preparation of meat, pancreatic juice, leguminous flour, etc.

Treatment.—A decided advance in the treatment of cholera was made by Cantani.¹¹⁶ He recognizes the following indications: 1. Against the deposition or multiplication of the bacillus in the intestines. 2. Neutralization of the chemical poison in

the intestines or its rapid removal from the blood. 3. Against the thickening of the blood by supplying water. The bacillus cannot directly be approached by drugs passing the mouth and stomach, and therefore *enteroclysis*, which by antiperistaltic motion can open the ileocæcal valve, offers the only effective local means. Carbolic acid, because poisonous, salicylic acid, little soluble, and corrosive sublimate, readily decomposed, are antiseptics possessing serious defects. Tannin, however, which the author had previously found effective in cholera nostras and cholera infantum, was held to be more likely to yield success. It was further argued that cholera is not apt to seize upon those working in tanneries, and that the tannin may be the active preventive. It was found that 1 per cent. of this body destroyed cholera cultures in an hour and a half at a temperature of 37° C. (98.6° F.) and that $\frac{1}{2}$ per cent. after six hours had decidedly impaired their vitality. In practice it was at once apparent that the premonitory diarrhoea was very favorably influenced, and that in no case which was treated early enough did the algid stage appear. Enteroclysis was practiced after each evacuation. To two litres of water, with a temperature of 38° to 40° C. (100.4° to 104° F.), five to twenty grammes (one drachm seventeen grains to five drachms eight grains) of tannin, with or without fifty grammes (one ounce five drachms) of acacia, and thirty drops of Sydenham's laudanum. In some instances one injection sufficed. Lustig¹²²⁰₁₈₈₇ had in one hundred and seventeen cases treated by Cantani's method thirty-four deaths, whilst at the same time amongst one hundred and ninety-three under other methods there were one hundred and forty-six fatal cases. The fact that enteroclysis has not only been successful in different parts of Italy alone, but is also praised after its trial in South America, places its usefulness upon a basis of surety. Its author argues that the tannin also in part meets his second indication, namely, in neutralizing the chemical poison. Herein it is applicable even in an advanced stage.

This neutralizing power of the tannin is limited, of course, to unabsorbed poisons; but that quantity which may already be circulating through the system is also aided in removal by the prevention of anuria, osmosis is kept up, the inspissation of the blood contracted, and the poison eliminated with the urine. The third indication was met by the author's suggestion, made in 1865.

Advocated by Samuel in Königsburg and Michael in Hamburg, it was first practiced in 1884. It consists in the introduction of a saline solution (3 per cent. sodium carbonate and 4 per cent. sodium chloride), temperature 38° to 40° C. (100.4° to 104° F.) into the subcutaneous connective tissue.

Hypodermoclysis gives startling results in arousing the patient in the algid stage. Its advantages over intravenous injections consist not alone in the danger of opening or manipulating veins, but also in absorption being more uniform and natural. In one hundred and eighty-seven severe cases thus treated the mortality was 39 per cent. Enteroclysis is used for the premonitory diarrhœa and the first stage; hypodermoclysis in the algid and typhoid stages. When treatment is begun with the disease already advanced, both are used.

The Chilian report already mentioned contains so much that is useful that a summary is presented. Hospitals of fifty to sixty beds are preferable to larger ones. They may be disinfected by sulphurous oxide fumes allowed to operate for twenty-four hours. Asphalt flooring, which is porous and cold, is to be discarded for closely fitting, tarred, pine boards which are daily washed with sulphate of copper solution or permanganate of potassium, one to one thousand. Culinary and table articles are drawn through an alcohol flame before use. The attendants wear suitable gowns or aprons. Sublimate solution, one to one thousand, is used for washing. Patients before their discharge receive a bath of the same, and clothing is thus disinfected. Drinking-water deserves the greatest attention.

In the beginning, where the digestive tract was loaded, calomel was given, and after an hour castor-oil. The diarrhœa continuing, or the alimentary canal being empty, the treatment was by stimulants and carminatives, and large quantities of hydrochloric acid lemonade. Later, enteroclysis and warm mustard baths 39° to 40° C. (102.2° to 104° F.) for ten to fifteen minutes and subsequent friction and warmth of bed gave very good results. On the other hand, in the algid stage and in asphyxia warm baths were uniformly harmful. Diet is to be severely regulated.

In the second stage of typical diarrhœa, vomiting, and cramps, enteroclysis was repeated every three or four hours, according to the patient's strength, three to five litres (quarts) with five grammes (one drachm fifteen grains) tannin in each, the diarrhœa usually ceas-

ing after two to three enemata. In the few cases where this failed ergotin (Dusart or Ivon) had some success. The ominous diarrhœa becoming bloody was of fatal significance. The only remedies showing any favorable action in this form were ergotin and enteroclysis of an infusion of ipecacuanha (two grammes [thirty grains] in one litre [two pints], allowed to stand an hour). These bloody stools, due to intestinal ulceration, were a marked characteristic of this epidemic. Against cramps dry friction and mustard with turpentine applications, and when very severe ice frictions, were employed. For vomiting: ice pellets and iced champagne and the potio Riverii. Good results also from the tincture of iodine in a little water were obtained.

On the approach of the algid stage: ether, camphor, and caffen subcutaneously; dry friction and mustard cataplasms; hot bottles and the hot-air bath. No food allowed.

For the algid stage and asphyxia, hypodermoclysis was the most important agent, fifty to two hundred grammes (one ounce six drachms to six ounces three drachms) being introduced according to the state of the pulse. This rose, as did the temperature, for some hours when the effect was favorable.

The injections were these: sodium chloride, four grammes (one drachm); sodium hyposulphite, three grammes (forty-five grains), to distilled water, one litre (two pints); or sodium hyposulphite, three grammes (forty-five grains); sodium carbonate, three grammes (forty-five grains); sodium chloride, four grammes (one drachm). Hypodermoclysis failing, peritoneoclysis was tried. Absorption was more rapid, the reaction lasted four hours, and perspiration appeared. The indication was found in a normal temperature with an absent radial pulse. Through it some were saved and in others life prolonged. The only evidences of a possible evil after-result were a slight tenderness and tympanites. The temperature did not rise above 37° C. (98.6° F.). The operator with his finger on the pulse watched the result; in young and vigorous patients fifty grammes (one ounce six drachms) sufficed. Should the pulse not reappear up to one hundred grammes (three ounces two drachms) may be injected.

Ice frictions in the third stage, and ice-bags to the head and spinal column showed favorable effects in beginning blood stasis. For præcordial pain and distress, ice-bags and ether injections. In

one desperate case a large hammer dipped in hot water was laid over the region of the heart with favorable action. For the typhoid state, enteroclysis of sodium hyposulphite two to three grammes (thirty to forty-five grains); quinine, one to one thousand, or salicylic acid, one to one thousand, with ice to head and spine. The sodium salt with decreasing, the quinine or salicylic acid with increasing, temperature. Nephritis with suppression: diuretics. Several observers recommend different drugs, some of which have been tried, others not at all, and none with a success deserving more than a passing notice at present.

J. Penna¹²²¹ prefers corrosive sublimate to tannin in Cantani's method. Yoert, according to Bouchard,⁶_{Nov. 10} had, with twenty-four centigrammes (three and seven-tenths grains) daily of corrosive sublimate, nine deaths in forty-five cases.

Pernice³⁷⁶_{Mar. 3} advocates five to ten grammes (one drachm fifteen grains to two drachms thirty grains) of naphthalin daily, by the mouth. Josias,⁷³ with thymol one to one thousand in all liquors given the patient, claims success and a mortality of 37 per cent.

Illingworth²²_{Sept. 28} praises the biniodide of mercury, one-sixteenth grain (0.004 gramme), three times daily. G. Johnson¹¹⁴⁵ advocates the usefulness of the treatment with castor-oil, and condemns opium. Mangen,⁵⁷_{Apr. 16} having had good results in the abortive treatment from the use of a prescription containing sulphuric ether, found the same to possess the power of preventing the development of cultures when the proportion was one to twenty-six. Mossé¹⁴²_{Dec. 16, '97} in eight cases used for the algid stage cold water or ice frictions; three recovered. Patients should be young and vigorous and the course of the disease rapid and severe. Pauly,⁸_{Apr. 11} has seen good results in cases like Mossé's from forced locomotion combined with cold-water frictions.

Winternitz¹²²²₁₈₉₇ considers hydrotherapy as giving the best results. He finds the chief indication to be to arrest the discharges. For prophylaxis a dietetic water cure fulfills all indications. Morning and evening water frictions for dry and anæmic skin. Digestive weakness and disturbance call for Priessnitz compresses at night. In cholera, from premonitory diarrhœa to asphyxia, the body is rubbed with a linen cloth wrung out of cold water, followed by sitz bath 8° to 14° C. (46.4° to 57.2° F.) lasting fifteen to thirty minutes and friction of the abdomen at the same time.

GASTRO-INTESTINAL DISEASES IN CHILDREN.

By L. EMMETT HOLT, M.D.,

NEW YORK.

MICRO-ORGANISMS IN THE STOMACH OF NURSING CHILDREN.

VAN PUTEREN⁵⁸⁶_{11.22}, ⁴¹_{Oct. 22} reports the results of one hundred and twenty-seven experiments made upon forty children, the ages ranging between three and seventy-seven days. Material for examination was obtained from the stomach by a sterilized Nélaton catheter and examined biologically.

The proportion of bacteria in the stomach was found to be greatly increased whenever the tongue was coated or deposits existed in the mouth, these being conditions in which bacteria in the mouth were most abundant. The bacteria were much more numerous in infants fed on cows' milk than in those nursed at the breast.

Of especial interest are the results which he obtained after the mouth had been thoroughly cleansed. In 18 per cent. of the experiments made *no bacteria* were obtained from the stomach of breast-fed children. In 41 per cent. the proportion to the average number found in the stomach under other circumstances was as one to one hundred and thirty. In the cases in which bacteria were found to be absent from the stomach, the digestion was apparently perfect; hence the writer reaches the conclusion that bacteria have no essential physiological function in the infantile stomach.

The author's experiments further show that the acidity of the stomach does not prevent bacterial growth. He made eight experiments to determine the acidity and found it to be only 0.6 to 0.8 per cent., while Miller had shown that 1.6 per cent. acidity was necessary to inhibit bacterial growth. The practical point emphasized is the importance of keeping clean the mouths of all young infants.

VARIETY.		FOOD.	
		Breast Milk.	Cows' Milk.
(a) <i>Not liquefying culture medium.</i>	Monilia candida	49 times.	
	Bact. lactis aërogenes	32 "	5 times.
	Oidium lactis	11 "	3 "
	Cocci	11 "	6 "
(b) <i>Liquefying culture medium.</i>	Cocci	32 "	8 "
	Staphyl. pyog. aureus	14 "	3 "
	Bacillus subtilis	10 "	4 "
	Thin, short bacillus	8 "	2 "
	Yellow, liquefying bacillus . . . . .	. . . . .	3 "
	Bacillus butyr. (Hueppe) . . . . .	. . . . .	11 "

This table gives the number of times the different varieties were met with in the infants examined, and shows that no single variety was so frequently found as to lead one to suppose it had a physiological action.

INFANTILE DIGESTION.

Escherich ³⁰⁶_{Bd. 57, H. 1 & 2} concludes from quite an elaborate series of experiments that the oral secretion in young infants is unimportant, and that milk reaches the stomach unchanged except from mixture with saliva and bacteria of the mouth. In the stomach it is quickly coagulated, and simultaneously with this begins digestion of casein by means of the pepsin, which process is only begun here. The principal part of this goes on in the small intestine, as well as the digestion of fats and sugars. He believes the stomach acts mainly as a receptacle for the food, out of which, after coagulation, it passes in measured quantities. Casein and milk-sugar are completely absorbed from the intestine, fat and inorganic constituents almost so. The fæces contain no casein, and the nitrogenous matters there present are from intestinal secretions.

When completely sterilized the writer found that there was no essential difference between the digestion of cows' milk and human milk. Although cows' milk contains three times as much curd as human milk, and the curds when formed were larger and firmer, it was as completely used up in the digestive process as was the case in human milk. The larger amount of fæces in infants fed upon cows' milk is explained by the imperfect absorption of inorganic ingredients and of fat, and this is principally due to the almost universal practice of overfeeding hand-fed infants.

The essential difficulties with cows' milk, then, are not the curd, but the bacteria which it contains and the quantity in which it is given.

CHRONIC DYSPEPSIA.

Sterilized Milk.—Penzoldt ⁸⁴_{Aug. 21} ⁹_{Sept. 29} states that for more than a year he has treated all cases of chronic dyspepsia at the Polyclinic with milk sterilized by Soxhlet's apparatus (described in section K, volume ii). The milk was prepared by the matron, and the exact quantity to be given was prescribed by the physician. The following are the conclusions he draws from his experience:—

In chronic dyspepsia the exclusive use of sterilized milk gives none, or only slow, improvement; if, however, a calomel purge is given at the outset, all milk withdrawn for a few days, and then sterilized milk begun, the results are favorable and relapses are less frequent. The explanation offered is that sterilized milk has no power to stop abnormal fermentation when such a process is actively going on. If, however, a temporary arrest can be accomplished by the disinfectant and purgative effect of calomel, and the withdrawal of milk for a time, its administration subsequently does not set up again the fermentation, provided the milk has been sterilized.

Washing Out the Stomach.—Epstein, the pioneer in stomach washing in children, gives a further report of his experience, ³⁹⁸_{Vol. 27, II, 1, 2} now extending to over one thousand cases. Thus far he has had no accident of any kind. The operation itself is mere child's play, and may be done in infants only a few days old. The patient is in the sitting posture, the body slightly inclined forward. There is no danger of passing the catheter into the larynx, this being quite difficult. The introduction is done quickly, and the gagging produced, as a rule, is only momentary. It is useful in all forms of gastric dyspepsia, but the greatest triumph by this treatment he has found to be in acute gastro-intestinal catarrh. While most useful in the beginning of the attack, its usefulness is not limited to this period, as Soltmann states.

The immediate effect of the irrigation of the stomach is a cessation of the vomiting. Then nothing but white of egg and water (one egg to half pint) is given for twenty-four or forty-eight hours. Some antifermentative agent is given after the washing, preferably benzoate of magnesia.

Dilatation of the Stomach.—Machon^{879, 51} states that the child's stomach shows a relatively small fundus, a large cardiac orifice, and a deeper position in the abdomen. Histologically its muscular coat is but slightly developed, especially at the pylorus. The mucous membrane shows more mucus and fewer peptic glands. In newly born infants it is fixed only at its extremities, the pylorus not extending beyond the median line, the cardiac end being at the tenth costal cartilage. When distended, the lowest point is always the pylorus, which is covered by liver tissue. The upper half of the lesser curvature runs parallel with the left side of the vertebral column.

Dilatation may be acute or chronic, and in the latter the whole organ may be involved or only a part of it. It may be functional or organic. Functional dilatation occurs in tubercular meningitis, with hypertrophy of the brain, with chlorosis, any cachectic condition, or as a result of chronic gastric catarrh.

Secondary dilatation of the organic variety rarely occurs. Narrowing of the pylorus is always the causative factor, and to this may be added congenital weakness of the muscular structure. Insufficient nutrition during the first months of life is another factor. Demme has recorded cases which were due to keeping children long in bed and to rickets. Baginsky^{4, Nov. 28} emphasizes the fact that a certain amount of dilatation of the stomach is almost always present in rickets.

The symptoms of dilatation are partly local and partly general and resemble those met with among adults. The diagnosis is readily made by inspection, palpation, or examination with a sound. Percussion does not give reliable signs.

Functional dilatation, depending upon nervous causes, usually disappears when the cause is removed. The prognosis of primary organic dilatation also depends upon how effectually the cause may be removed.

Prophylaxis is of the utmost importance. General treatment must be attended to. Electricity and cold applications are to be used only in the functional form.

GASTRO-INTESTINAL CATARRH.

Etiology.—Seibert^{59, Mar. 24} has studied the influence of atmospheric changes upon the prevalence and the mortality of gastro-intestinal

catarrh. Charts I and II show the relation of the mean monthly temperature to the prevalence (morbidity) and mortality respectively. These charts show that morbidity and mortality lines are essentially the same.

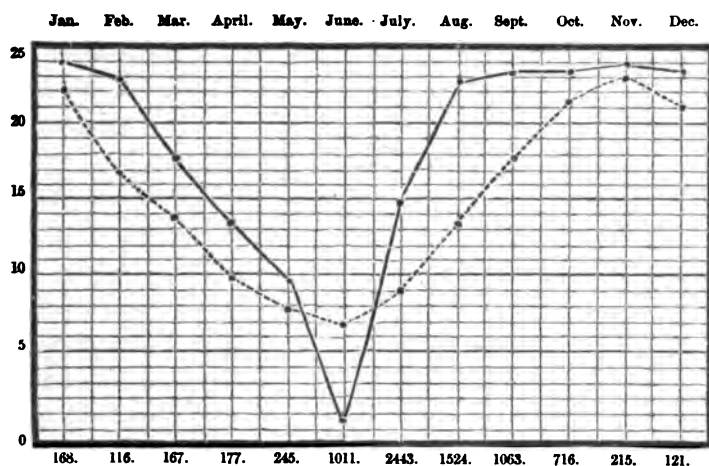


CHART I.—MORBIDITY OF CHOLERA INFANTUM, GERMAN DISPENSARY: 8036 CASES, AND AVERAGE MONTHLY TEMPERATURE.

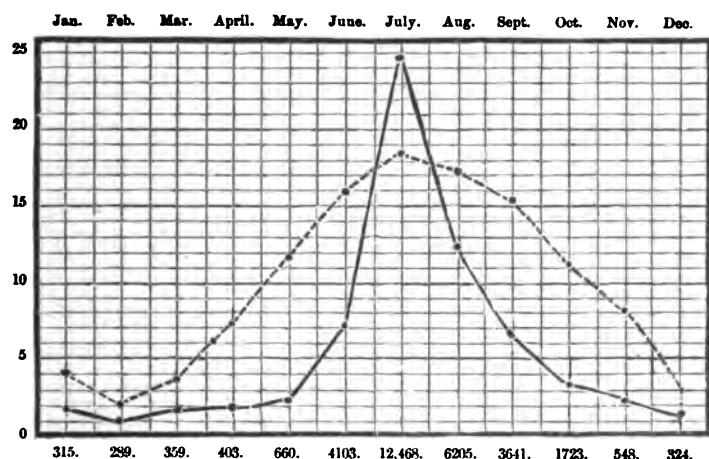


CHART II.—MORTALITY OF DIARRHOEAL DISEASES IN CHILDREN UNDER FIVE YEARS OF AGE. NEW YORK CITY: 31,048 CASES, AND AVERAGE MONTHLY TEMPERATURE.

A separate investigation of each individual month, as to its daily temperature, did not substantiate the inference that the number of cases and of deaths varied directly with the temperature. In the ten July months studied, there was no correspondence between the mean temperature for those months and the number

of cases or deaths; *e.g.*, July, 1880, was decidedly warmer than 1879 or 1884, and yet fewer cases occurred.

The conclusion reached is that the disease does not depend directly upon the temperature. A certain elevation is, however, necessary; as soon as the minimum temperature remains above 60° F. (15.6 C.) for several days in succession the disease becomes epidemic; while the mean temperature is below 58° F. (14.5 C.), as is true of the month of May in most years, the number of cases is no larger than in a winter month. A study of barometric pressure, humidity, rainfall, and velocity of wind currents failed to show any correspondence between their variations and the prevalence of the disease.

The only atmospheric factor, then, is the temperature, and this must act in other ways than directly upon the infants. Milk turns readily at 60° (15.6 C.); hence, transported as it is during the night, it must show considerable decomposition before it reaches the consumer whenever the night temperature remains above 60° F. (15.6 C.).

The vegetable matters contained in the sources of water supply undergo decomposition at the same temperature, so as to be perceptible to the senses.

The great difference in the mortality records of July and August, the mean temperature of the two months being nearly the same, is explained by the author partly by the fact that the number of susceptible children in August is less, owing to the mortality of July, and partly by the fact that in August all hygienic regulations are more rigidly enforced.

T. Clark Miller ⁶⁹_{July 21} criticises the position by Seibert, giving in as evidence the mortality records of Baltimore from diarrhoeal diseases in young children. These statistics corroborate in all essential particulars those furnished by Seibert, of New York. Miller takes the ground "that the condition under which cholera infantum develops, and the only condition necessary to its development, is continued high temperature day and night—a mean thermometer above 75° F. (24° C.), with small daily range."

Meinert, ⁶⁹_{June 14}, ⁹⁹_{July 28} in a careful investigation conducted in Dresden in 1886 regarding five hundred and nineteen fatal cases, reaches the conclusion that the most cases occur on *hot days with little wind*, other atmospheric conditions having but little influence. He

finds, further, that in this city, with a population of two hundred and forty-six thousand, and five thousand eight hundred and ninety-three infants under one year, there were among them in a single season five hundred and eighty fatal cases of diarrhœal disease.

He has studied, also, the influence of the situation of the rooms, and finds that the greatest relative number of deaths occurred among those living on the ground and first floors. Basements had a much lower rate of mortality. This he explains by indoor temperature being highest and the air currents least, in the parts referred to (ground and first floors).

As to the influence of artificial feeding, of four hundred and seventy-nine fatal cases, only nineteen were nursed at the breast, none of these being over three months old. The usual food was cows' milk.

The direct action of heat upon the infantile organism, this writer emphasizes strongly. With increased external heat there must be active radiation; this is mainly accomplished by giving water; in those artificially fed this want is usually met by over-feeding, one of the many evil results of which is increased heat production.

The writer reports thermometrical observations showing, in infants, before the onset of marked diarrhœal symptoms, considerable febrile disturbance, which he looks upon as a prodromal fever.

The prevalence of diarrhœal diseases in different latitudes is also here considered. On the Continent of Europe, while the temperature steadily increases as we pass from north to south, the mortality from diarrhœal diseases as steadily diminishes. This is largely due, the author thinks, to the more common practice of mothers nursing their children; another cause is more out-of-door life for the child and more fresh air in the houses. In Dresden the greatest mortality was in those under six months of age.

INTESTINAL BACTERIA.

Baginsky⁸⁸_{Ba.12,H.5} has continued the investigation of normal intestinal bacteria in a series of experiments upon the bacterium *lactis aërogenes* (Escherich). His results are as follow:—

1. This bacterium is very active in decomposing milk-sugar,

with the production of only a very small amount of lactic acid, and with the production of acetone. 2. Most of the acid formed can be shown to be acetic acid. 3. This formation of acetic acid goes on either with or without the access of air. 4. Bile constituents do not hinder this variety of fermentation.

From the above facts one can conclude with certainty that acetic acid fermentation does go on in the intestine where bile is present and oxygen excluded. 5. The bacterium changes neutral lactates into butyrates. 6. It does not change starch into sugar. 7. Acetic acid arises from its action on starch only when oxygen is present. 8. It does not decompose casein; the amount of albumen necessary for its growth is, therefore, small. 9. During the production of acetic acid, gases are given off— CO_2 , hydrogen, and methan. The process, then, is not a simple lactic acid fermentation, but a methan fermentation of acetic acid (Hoppe-Seyler). 10. The bacterium decolonizes methylene blue slowly, and therefore forms reducing material in moderate quantity, which may act by diffusion at a distance.

Baginsky proposes to substitute the name bacterium aceticum for that of bacterium lactis aërogenes, as being more descriptive and less confusing.

As to the relation of normal to pathogenic bacteria, other interesting points of practical interest were brought out by these experiments. Inoculations made from flasks where the cultures were old remained sterile, showing that the bacteria had died from the acetic acid which they had produced. This was confirmed by the addition of the acid to fresh cultures, a very small quantity being sufficient to stop the growth.

In his experiments upon bacteria found in the stools of children suffering from diarrhœa, Baginsky⁸⁹ has isolated two varieties which liquefy gelatine. One of these is widely diffused in water and produces a green coloring matter. It seems to be identical with that to which Hayem and Iésage have attributed the cases of green diarrhœa (from insufficient grounds, Baginsky thinks).

The other variety also liquefies gelatine, but more slowly, and superficially forms a white pellicle and a white mass at the bottom of the gelatine.

The latter bacterium is almost constantly found in diarrhœa

stools, and experiments on animals show it to have pathogenic properties.

The presence of the bacterium aceticum in gelatine prevented the development of this bacterium. Hence, he concludes that the destruction of abnormal bacteria in the intestine—could it be done—might do harm by destroying at the same time the normal bacteria which seem to stand on guard to prevent the entrance and development of pathogenic forms.

For an excellent *résumé* of the work done during the past five years on the subject of bacteriology of the intestines, the reader is referred to an article by Jeffries.⁸⁹
Sept. 6

The Bacillus of Green Diarrhœa.—Lesage⁴¹⁰
Feb. 12 has followed up the experiments begun by Hayem and others, and describes the bacillus¹⁸
Sept. 15 as follows:—

The bacillus is small, of variable length and thickness, according to the age of the culture and the medium. It shows as it grows a disposition to form long threads. It grows in two ways, by the splitting up again into bacilli and by forming endogenous spores. The splitting-up process is observed in the intestines of animals which have been successfully inoculated, in potato cultures, and in others where the bacillus does not grow particularly well. Spore formation is seen in gelatine and in other good culture media. The bacillus secretes green coloring matter of various shades, according to the age of the culture and amount of air present. The more oxygen present, the brighter green is the pigment. It does not liquefy peptone gelatine.

Acids, especially lactic acid, were found to exercise a very marked effect in preventing the growth.

The air may be the medium of conveying the bacillus, so that the disease is a contagious one and calls for isolation and all disinfectant precautions taken in infectious diseases.

Experiments upon animals made by subcutaneous injections were negative. It was otherwise when intravenous injections were made, or when the bacilli were introduced directly into the stomach or intestines. In the most of the latter cases (experiments being made on dogs) a typical green diarrhœa was produced, in which the pathogenic bacillus could in every case be demonstrated.

I think it only proper to state that these experiments have not

thus far been confirmed, and that they are not accepted by the most competent bacteriologists in this country.

Bacteria Found in Summer Diarrhoea.—Booker⁴⁶² states that we must be cautious in assuming that any causative relation exists between strange forms of bacteria in the fæces and existing disease.

1. These bacteria may be a necessary accompaniment of the altered intestinal contents without influencing in any way the disease.
2. While not primarily originating it, they may by their presence cause a continuance and aggravation of the disease.
3. They may begin their work outside the body, in milk or other food, and cause abnormal products of fermentation, possibly poisonous ptomaines.
4. These strange bacteria may be the essential and specific cause of the disease. Without further proof in an individual case, the presumption is against the last proposition.

Eighteen varieties have thus far been isolated and cultivated; inoculation experiments have been made with many. His work, as yet incomplete, does not admit of positive conclusions, but the following deductions are made from the work so far done.

The bact. coli commune (Escherich) does not disappear from diarrhœal fæces, but seems to diminish in number in proportion to the severity of the disease. It was constantly present, but did not predominate as in healthy milk fæces. It was not found in dysenteric discharges. No single variety was found which bore a constant relation to diarrhœal or dysenteric discharges. One variety was found almost constantly, and generally predominating in cholera infantum and catarrhal enteritis, but it did not appear in dysenteric or healthy fæces. It resembled the bacterium lactis aërogenes (Escherich) and is regarded as probably, but not positively, identical with it.

The number of varieties of bacteria in diarrhœal stools far exceeds that of dysenteric or normal stools. The actual number of individual bacteria is not greater than in healthy stools. The number found in dysenteric stools was less than in diarrhœal stools, and while all varieties that occurred in the former were found in the latter, the opposite was not true. The bacteria found differ from those described by Escherich, as the inconstant varieties seen in healthy milk stools.

The number of varieties of micrococci, liquefying, and chromogenic bacteria was less than that found by Escherich in the

healthy suckling. Two varieties appeared to possess marked pathogenic properties, in others they were less marked, and some appeared entirely non-pathogenic.

A liquefying bacillus was frequently, but not constantly, present in cholera infantum, and not in other forms of diarrhœa or healthy stools, which produced changes in albuminous compounds that proved rapidly fatal when injected in small quantity into the veins of rats; and milk cultures of the same bacillus generally resulted in death when fed to mice or guinea-pigs. Diarrhœa was not a prominent symptom in the animals on which the experiments were made. Pronounced diarrhœa was noticed in a single case.

None of the bacteria were capable of multiplying in ordinary hydrant water.

All varieties grew well in milk. Some produced coagulation with an acid reaction; some rendered milk acid without coagulation; some rendered milk alkaline without coagulation; one variety coagulated milk with an alkaline reaction, and one had no effect on milk.

Legrand¹¹⁸ gives a full report of a single case of *cholera infantum*, with biological and histological examinations of the discharges.

The patient was a child, six years old, who died in collapse after thirty-six hours' sickness with the classical symptoms of cholera infantum.

Plate cultures were made from intestinal contents immediately after death and at the end of twenty-four hours. They did not differ materially in the results, as both showed a great predominance of a single microbe. This appeared under two forms: first, as an "ovoid micrococcus" in short chains, sometimes as diplococci; second, a rectangular bacillus in articulate chains. These varieties were believed by culture experiments to be identical. The ovoid forms were also obtained in cultures made from the stomach. None were found in the blood, nor in liver, spleen, or kidney.

In the hardened specimens of the intestine the same form was obtained in abundance, but the bacteria were superficially situated, none being found in the deeper tissues or vessels. The microbe was readily cultivated in peptone gelatine both when air was present and when it was excluded; better under the latter

condition. It did not liquefy gelatine. Potato cultures were not successful. In neutral or alkaline bouillon it grew rapidly. In bouillon acidulated by HCl in the proportion of 0.5 per cent. there was no growth, nor when lactic acid in the proportion of 2 per cent. was added. Smaller quantities of lactic acid retarded growth, but did not wholly prevent it.

Inoculation experiments were made in dogs, rabbits, and guinea-pigs. The germ was not pyogenic. In no case were any septicæmic symptoms produced. A puppy was fed three days upon milk to which cultures were added without any unpleasant symptoms. (The acidity of the gastric juice in the dog is known to be marked.)

In two cases only was there a fatal result. One of these was from an anærobic culture. Diarrhœa was not a symptom; but the upper intestine was congested at autopsy, and the germ found quite abundant among the epithelial cells.

Bacteria in the Air in Infected Districts.—Henry Tomkins²_{Aug. 22} reports a series of observations made in Leicester during the past three years. While diarrhœal disease existed in the whole town, it prevailed only in a certain low-lying district quite well defined. Food and water supply were the same here as in other parts of the town. An examination of the air in the infected district showed it to contain from three to six times as many germs as in the non-affected districts.

Certain of these microbes could be cultivated artificially, and the products of their cultivations were capable of producing diarrhœa in the human subject.

The Relation of Putrefactive Processes to Diarrhœal Diseases.—Baginsky⁶⁹_{Nov. 20, 21} states that the fact that cows' milk usually agrees very well with infants in winter, but in summer causes diarrhœa, favors the view that bacterial changes in milk are of extreme importance in producing diarrhœa. Some writers argue for an acid, some for an alkaline fermentation; all sorts of poisonous ptomaines have been mentioned as the causes of the disease. The fact is that milk digestion in the infant is a very complex process, and we cannot reproduce all the conditions in the laboratory. The different secretions have peculiar properties. Decomposition in the intestine affects the walls of the intestine, and if long continued even adjacent organs, like the liver and pancreas.

It is a great mistake to look upon the disease simply as a process of abnormal decomposition. Lesions of considerable importance are found even in simple dyspepsia when continued. Although the fermentative process may act as the primary cause, it does not account for the subsequent phenomena.

The way in which abnormal fermentative changes take place he describes as follows: The normal bacterium *aceticum* (*lactis aërogenes* of Escherich) hinders the growth of pathogenic germs. If the normal fermentation exceed a certain limit, the *B. aceticum* is itself destroyed, and the excess of acetic acid interferes with the action of the pancreatic and biliary secretions. It also acts as an irritant. If the fermentative process goes on further we have gases formed, especially methan. Continued disturbances of this kind gradually lead to catarrhal changes in the mucous membrane. These conditions open the way for numbers of bacteria, which find their way into the intestines to develop. The result of this is a consecutive alkaline fermentation due to germs which act by dissolving albumen.

It would be of great practical value could we say positively when we have to do with an acid and when with an alkaline fermentation. It is very likely that both processes may be going on at the same time in different portions of the intestines. The reaction of the stools gives no clue.

It has been shown by Baumann and others that phenol, scatol, indol, etc., are formed whenever albumen is decomposed in the intestine, and that they are excreted in the urine in combination with sulphuric acid. To test urine for these products is a somewhat complicated process, but at present it is the most reliable means at our disposal to determine the existence of albuminous fermentation.

Concerning the relation of putrefactive processes to diarrhoeal diseases Vaughan,⁹ advances the following propositions: (1) The factor which is most frequently operative in summer diarrhoeas in children under two years is to be found in the food; (2) the changes in the food by which injurious substances are produced may take place either before or after it is taken into the body, and they are due to micro-organisms; (3) the micro-organisms which produce the catarrhal or mucous diarrhoeas of infancy in summer are probably only putrefactive in character, but those causing true

cholera infantum, with serous discharges, are pathogenic; they produce a definite chemical poison, the absorption of which is followed by the symptoms of the disease; (4) the bacteria which produce diseases prove harmful by splitting up complex molecules and forming chemical poisons.

Baruch,⁹_{July 7} takes the ground that the summer diarrhœa of infants is chiefly, though not solely, due to the ingestion and multiplication of micro-organisms, which create in the gastro-intestinal tract conditions analogous to those found in wounds to which septic material has had access.

He further argues that insanitary conditions, poverty, filth, etc., are entitled to be placed only among the predisposing causes.

The indigestibility of the casein of cows' milk by artificially fed children is of no importance, since in winter this is borne without serious consequences. He concludes that the kind of food, if it be reasonably constructed, has little to do with producing diarrhœal disease, provided the access of micro-organisms in its preparation can be prevented.

Rachford,⁹_{Sept. 1} holds: 1. That the chief, if not the only direct causes of "summer complaints," are abnormal intestinal fermentation of food-stuffs. These are always caused by bacteria. 2. At present we are unable to make an exact etiological classification of these diseases, but it is probably true that there are quite a number of pathogenic bacteria, each capable of producing definite changes in food which will cause characteristic symptoms. 3. The disease, being of bacterial origin, is necessarily infectious. It is probable that not all the diseases embraced under the general term are equally infectious.

This writer believes that bacteria may cause disease in any one of three ways: 1. By interfering with the growth and function of the bacteria normal to the intestine. In this way bacteria which do not produce poisonous ptomaines or irritating products may cause digestive derangements. It is quite likely that this form of disease may act as a predisposing cause to other forms. 2. By the formation of irritating materials during the fermentation of food-stuffs in the intestine, especially in acid fermentation. 3. By producing ptomaines, which act as physiological poisons.

EXAMINATION OF STOOLS.

Pathology of Green Stools.—Pfeiffer³⁶⁶_{BL, 20, H, 1},⁵¹ says that the old idea that green stools depend upon an acid condition of the intestinal tract is no longer tenable. Biedert had explained that bilirubin was changed into biliverdin by fermentation with acid products. If, however, any of the organic acids found in the intestine are added to fresh yellow evacuations of a healthy child, the color becomes a more intense yellow, even if exposed to light for several days. Nitric acid, however, can turn yellow stools green, but this does not continue long and is followed by an intense yellow color. The green color may be produced by alkalies found in the intestine. Thus a drop of a fresh solution of sodium or potassium added to fresh yellow stools causes first a brown color and then after some exposure to light an intense green. Stools green when passed can never be turned yellow by acids, but are made a deeper green, the biliverdin separating from them in dark-green flakes.

It is well known that the reaction of the whole intestine, large and small, of a healthy child breast-fed is acid; consequently, any alkalinity would be pathological. The reaction of green stools is always weakly acid or neutral. The green color may, therefore, be due to the fact that soon after the bile enters the intestine the contents are so strongly alkaline that bilirubin is converted into biliverdin, and the stools, once green, cannot be again turned yellow. Although acid when passed, the acidity is not the cause of the green color.

Everything which makes the intestinal contents more alkaline tends to produce green stools. It may depend upon the fact that the gastric juice is not sufficiently acid to acidify the breast milk. Bicarbonate of soda added to milk in sufficient quantities will produce green stools.

[The practical application of these facts will be alluded to under "Acid Treatment."—ED.]

Nitrogenous Matters in Stools.—Tschernoff³⁶⁶_{BL, 20, H, 1} shows that the former methods used of determining the amount of nitrogenous matters in fæces of infants have been faulty and have given results which are wide of the truth. In the first place, the behavior of human and cows' milk to lead chromate is decidedly different. The amount of albuminous matters precipitated from human milk is 1.41 per cent.; from cows' milk, 3.12 to 3.20 per cent. Estim-

ing the same by the amount of N, the results are, for human milk, 2.33 per cent.; for cows' milk, 3.14 per cent. Uffelmänn found by the old method of analysis the maximum amount of albuminous matter in the stools of healthy nursing infants to be 1.5 per cent. of dried matters. Estimating the same from the amount of nitrogen present, the percentage is given by the writer as 30 to 32 per cent. (!) Uffelmänn's analysis gave of dry substance in stools—

Fat,	.	.	.	.	.	.	.	25	to 30 per cent.
Ash,	.	.	.	.	.	.	.	10	"
Albuminous matters,	.	.	.	.	.	.	.	1.5	"
									<hr/>
									36.5 to 41.5 "

leaving 58 to 60 per cent. to be made up by the carbohydrates—a proportion manifestly too great. Tschernoff's estimate of 30 to 32 per cent. would make the carbohydrates 28 to 30 per cent.

In children fed on cows' milk and Nestlé's food the amount of albuminous matters in the fæces was decidedly greater than in health. In children suffering from dyspepsia, fed on cows' milk or wet-nursed, the proportion of albuminous matters fell considerably below the normal, steadily increasing as the cases recovered.

In children with enterocolitis the amount varied from less than one-half to the normal amount, but at no time exceeded it.

These results differ from what would be expected, and are explained by the author as probably due to the increase in other elements of the stools, especially the proportion of fat.

The amounts of leucine, tyrosine, scatol, etc., are so small in the stools of infants that these substances can be ignored in analysis.

The writer's conclusions are: 1. That the amount of N in stools is quite constant, being with breast-milk 5.2 per cent. and with cows' milk 6 per cent. of the dried substance. (The amount of albuminous matter is obtained by multiplying this percentage by 6.4.) This difference is partly to be explained by the difference in assimilation of the casein and partly by the difference in the relative amounts present in human and cows' milk. 2. The percentage of N is diminished in dyspeptic disorders from the great increase in the amount of fat present. 3. The percentage of N is always higher after a change of diet.

In estimating the amount of N in the foregoing experiments the writer makes use of the volumetric method.

Animal Parasites in the Stools of Children.—Von Jaksch⁸ finds the fæces of breast-fed infants to be poor in entozoa. Worms are absent and infusoria scarce. Of the latter only the *cercomonas intestinalis* (Lambl) was found.

In older children, whether symptoms existed or not, the ova of *ascaris lumbricoides*, *oxyuris vermicularis*, and *trichocephalus dispar* were almost always found, and in many of these worms were passed after anthelmintics. *Tænia* were seldom found, and, contrary to the statements of other writers, the only cases in which these were seen were in children who were not anæmic.

Infusoria were abundant.

1. *Monadina*, found repeatedly in stools of nurslings as well as those on meat diet.

2. Much more abundant and predominating in watery stools, ellipsoidal bodies, with a sharply defined capsule and darker homogeneous contents. These bodies are insoluble in ether and not stained by aniline dyes. They are about three times as large as red blood-cells. They resist strongly the action of acids, cold, and decomposition. They were not cultivated or seen in other forms. They were so common that the author believes them to be without pathological significance.

In a child with pleural exudation with watery stools of a reddish color, separating into two layers after standing, besides red blood-cells, leucocytes, micro-organisms, and the infusoria described, the following were found:—

1. Large globular bodies, quite homogeneous, and showing at periphery a semi-lunar incision. These were contractile and assumed various forms. The semi-lunar portion appeared darker than the rest of the body, and stained deeply with aniline dyes, while the rest of the body but lightly.

2. Analogous to the above, but containing at the site of the semi-lunar space a granular mass of a yellowish color. This body was also stained by aniline dyes and resisted the action of ether.

3. A predominating form, in general appearance resembling those described, (1) having the semi-lunar space, but within showing a variety of cell-elements; (a) white blood-cells; (b) red blood-cells; (c) pigment granules. The reactions to dyes were as those above described. These have a diameter five or six times that of

a blood-globule. This form is believed to have some connection with the disease. These bodies resemble somewhat the amœba coli of Lösch, and the cercomonas intestinalis of Grassi and Lambl, but differ in many essential points. The writer thinks it clear that these bodies are infusoria, and a form hitherto undescribed. In the article drawings are given.

TREATMENT OF DIARRHOÆAL DISEASES.

Diet.—Escherich¹⁰⁵⁶ has shown the effect of a change of diet upon bacterial growth in the intestine,—that one set may be made to disappear in a few days, others taking their place, as when milk is stopped and meat diet substituted.

This discovery is the basis of most of the advances made in the direction of adapting diet to disease. Escherich, recognizing two well-defined varieties of intestinal fermentation, acid and alkaline (*vide* paragraph upon intestinal fermentation), has proposed and adopted the following dietary³⁵ :—

In acid fermentation he excludes milk, all sugars and starches, and gives albuminous water, meat broths, and peptones. In alkaline fermentation, hydrocarbons are recommended, particularly dextrine. He mentions the fact that thirty years ago Moore treated successfully cases with putrid stools by the administration of sugar, a teaspoonful every two hours.

Baginsky,⁶⁹ while admitting the premises of Escherich's argument, finds practical objections to the diet proposed. He states that peptones are badly borne in early life; that the dextrine preparations are not free from starch, and besides contain nitrogenous substances; and, passing from the upper to the lower part of the intestine undigested, these substances set up a fermentation of the worst kind. He calls attention to the fact that Behrend and Silber, in 1857, found that sugar agreed well in certain cases of diarrhœa, and Hirschler has recently shown that milk-sugar inhibits the decomposition of albumen.

Failure has resulted heretofore from the fact, which has been too much lost sight of, that we have not only an abnormal process of fermentation, but a diseased mucous membrane to deal with. Hence, he concludes that only experience can solve this much-vexed question. The diet of Escherich may be adapted for one part of the intestine and not for another.

Escherich considers the reaction of the stools a sufficient means of determining the nature of intestinal fermentation. This Baginsky and others deny.

Christopher⁹ has followed out the diet suggested by Escherich, which appeals to him as the rational one, but does not give any details as to the results obtained.

White of egg and water is regarded by Epstein and others as the blandest form of nourishment which can be given and is used by them after washing out the stomach (*vide*). Animal broths are next allowed.

Sour milk is recommended by O'Neil,²² which he thinks is valuable from the lactic acid which is present.

Fermented milk, as kephir, koumiss, etc., is well spoken of by several writers; its utility seems to depend upon the organic acids which it contains.

Milk.—Meigs⁹ is almost alone among the contributors of the year in regarding milk as the best food for by far the largest number of cases of diarrhoea. Even in cases of cholera infantum, he thinks, if the child is at the breast, it should continue to be nursed, unless there is some distinct reason for suspecting the breast milk to be at fault. Water, stimulants, and beef-juice may be used as adjuvants, but milk should be the main-stay. The writer's views regarding the preparation of cows' milk for children to be hand-fed, i.e., dilution, with the addition of cream, lime-water, and milk-sugar, he has frequently published elsewhere, and need not be detailed here. Of the four things, the milk-sugar he regards as the least essential. In his experience, the cases are few which reject milk altogether and do well upon broths; the latter much sooner become disgusting to the infant.

The manner of feeding is important; it is not often necessary or desirable to feed any child more frequently than every two hours. Longer intervals in most cases give better results.

Meigs contends that it is far from being established that *all* cases of cholera infantum are due to micro-organisms or a chemical poison, and that the disease does occasionally occur in infants nursed by healthy women. When it has been so clearly demonstrated that no food succeeds so well in hand-fed infants in health, it seems irrational to him to throw aside this food so soon as the children become ill. Other foods are, at most, a makeshift only.

Meigs' remarks are with reference to plain milk. Neither peptonization nor sterilization are mentioned in his paper.

Jacobi^{51 Feb} says, in acute gastroenteritis "no raw milk, no boiled milk. No milk at all in any mixture in bad cases." When severe, total abstinence from food for six hours or longer, then mucilaginous or farinaceous decoctions in teaspoonful doses. He recommends the following combination :—

Barley-water, 3v (155.5 grammes).
 Whisky or brandy, 3ij (7.8 grammes).
 White of one egg,
 Salt and cane-sugar in small amount.

Of this a teaspoonful is given every few minutes. Later in the disease a tablespoonful of boiled milk may be added to the formula. The same may be mixed with mutton-broth. Beef-tea, as usually made, contains many salts and little albumen, and should be avoided. To arrest vomiting, nothing is so efficient as abstinence. In cases with copious watery discharges and hydrencephaloid symptoms water must be given, either by mouth or rectum.

Sterilized Milk.—Penzoldt^{84 Aug. 31; 9 Sept. 29} reported to the Medical Society of Erlangen his experience for the year with milk sterilized by Soxhlet's method. The number of cases of diarrhœa was notably reduced. As a prophylactic measure he thinks it advantageous. On this point Heubner's experience^{31 Jan. 31} is in the same direction. Sterilized milk was used in thirty-nine children for periods varying from two weeks to three months in the summer season. Only five of the cases were over six months old. Among these one death occurred, not from gastro-intestinal disease. Of the cases under six months, seven died of intestinal disease and three from other causes. Considering that these were ill-conditioned children and taken from dispensary practice, the writer regards the results as surprisingly good. They were decidedly better than were obtained by him by other methods of treatment under similar circumstances.

My experience coincides with that just recorded, *i.e.*, that sterilizing milk is of value as a prophylactic means, but of no advantage in cases of diarrhœal disease.

Malted Foods.—Clendinnen^{80 Apr. 16} advocates the addition of malt to milk, and claims good results from this practice. Malted milk is highly spoken of by Dessau.

It seems to be quite a uniform experience among writers that all of the malted foods are useful where milk disagrees. These and the broths and beef preparations are the main reliance of the majority. In what sort of cases the albuminoids have been found to agree best, and in what the carbohydrates, unfortunately but little is said, and it is on this point that most light is needed.

Washing out the Stomach and Intestine.—Ehring³⁴⁶_{184, 98, 11, 2} has discussed this subject somewhat exhaustively and speaks enthusiastically in favor of this method of treatment of gastro-intestinal catarrh. For the *stomach* he uses a Nélaton catheter No. 8-10; to this is attached a Y-shaped glass tube, and to the other two extremities of which are a few feet of rubber tubing; through one of these pieces the water flows to the stomach; then, this being compressed, it flows out through the other into a vessel. The latter is accomplished by pressure upon the stomach by the hand. The water should be allowed to flow in slowly and no undue distention permitted. The operation is continued until the water returns clear. Half a pint to two pints are used for a single washing. Simple luke-warm water may be used or medicinal solutions at the same temperature; if the latter a small portion is allowed to remain in the stomach. The favorite solutions of the author are a 3 per cent. solution of benzoate of soda and $\frac{1}{2}$ per cent. of resorcin.

The contra-indications to the employment of stomach washing are great exhaustion and threatening collapse; pneumonia only when very extensive.

Intestinal irrigation is carried on by means of a rectal tube introduced high into the intestine. Young children should be placed upon the back with the hips elevated, older ones in the knee-elbow position; the abdomen should be manipulated during the injection. The introduction of the tube is facilitated by allowing the water to flow during the process.

The obturator to prevent the water flowing out by the rectum before the bowel was filled was not found necessary, simple digital compression sufficing for this purpose.

As an injection fluid, a luke-warm salt solution is preferred, of the strength of 0.6 per cent. (three grains to the ounce of water). After washing with this, a 2 per cent. (ten grains to the ounce of water) solution of tannic acid or weak solution of nitrate of

silver may be introduced and retained. To this a small amount of opium should be added to prevent expulsion.

The indications for mechanical treatment are, whenever the disease can be localized, and especially in cases attended by abnormal fermentative processes.

Results are reported in three hundred and seventy-seven cases treated by this method, embracing all forms of disease of stomach and intestines, the greater proportion being cases of acute gastro-intestinal catarrh. Of these two hundred and fifty-nine (68.7 per cent.) were cured, fifty-five (14.5 per cent.) were improved, in sixty-three (16.7 per cent.) there was no improvement and the cases terminated fatally.

The observations were made upon dispensary cases. The best results were obtained in gastric dyspepsia with fermentation.

The diet in all cases was carefully regulated. We gather from the article that little or no other medication was employed. (In the article a full bibliography of the subject is given.)

Seibert,¹⁵⁰ claims that as the mechanical removal of fermenting masses is what is aimed at, simple luke-warm water is all that is needed. Weak antiseptic solutions are of no special value and strong ones are objectionable. He reports over twenty cases treated by washing of the stomach between the ages of seven weeks and fourteen months with excellent results. He cautions against using too small quantities of fluid.

Widerhofer³⁵ Feb. 16; Mar. 17 recommends a $\frac{3}{10}$ per cent. solution of salicylic acid—one and a half grains (0.097 gramme) to the ounce of water—for intestinal irrigation. Carbolic acid is not to be used. Astringents may be employed in late stages.

Baruch,⁹ July, reports that he has used with gratifying results irrigations of warm (previously boiled) water in which half a drachm (1.94 grammes) of bicarbonate of sodium to the quart had been dissolved. He repeats the irrigation every three to five hours.

Baginsky,⁴ Nov. 26, takes ground against the view of Epstein that it is only stomach irrigation that was valuable in catarrhs of the intestine. In his opinion both gastric and intestinal irrigation are to be used. Stomach washing had not given such good results in his hands as Epstein claimed. Washing out of either stomach or intestine is contra-indicated in any abdominal inflammation when the peritoneum is involved. It is useless in cholera infantum when

collapse has begun. It is especially valuable in habitual vomiting of dyspepsia following weaning, and in all cases (chiefly in rachitic subjects) where an atonic condition of the muscular wall exists. In most of these rachitic cases there is dilatation of the stomach.

It is still an undecided question whether there is anything better than plain water for stomach washing. The benefit derived from intestinal irrigation is not limited to cases of diarrhoeal disease. Many cases of vomiting are relieved by it, especially when there is co-existing catarrh of the small intestine. For intestinal irrigation a simple saline solution must be used, as this mucous membrane is not accustomed, like the stomach, to plain water.

Henoch,⁴_{Nov. 28} thinks that emetics in older children are too little used, and perhaps, on the whole, preferable to washing out the stomach. He argues for limitations and more exact indications in the use of this measure, which has been employed too indiscriminately. The one symptom against which stomach washing is useful is persistent vomiting. The operation requires care and time, as, if performed hastily, injury may be done. Henoch does not rely upon this measure in cholera infantum, and thinks too much has been claimed for it.

Klein,⁴_{Nov. 28} speaks favorably of stomach washing after using it in thirty cases of cholera infantum. The process should in all cases be carried on until the water flows clear. In the majority of cases only one washing out was done. The vomiting was promptly controlled by this in most, but not all, of the cases.

Leo,⁴_{Nov. 28} is not enthusiastic over this method of treatment. His method is to add some antiseptic, usually thymol, to the fluid used for the intestines.

Acid Treatment.—*Lactic acid*, first recommended by Hayem two years ago, has been brought prominently forward again by Lesage.⁹¹_{Dec. 17, Jan.} The method of administration used by Hayem and his followers is to give a 2 per cent. solution—nine and one-half grains (0.62 gramme) to the ounce (31 grammes) of water—of the acid, to which a little syrup or mint has been added. Of this the usual dose is half a drachm (2 grammes), fifteen or twenty minutes after feeding or nursing; in severe cases, at much shorter intervals.

The bacteriological experiments upon which this treatment is based are referred to under Bacteriology.

The treatment is advocated (1) in acute infectious diarrhoea,

where the stools are numerous, watery, often foul, but yellow in color; when an acid or neutral reaction exists, a purge may advantageously precede; (2) in green bacillary diarrhœa (in green bilious diarrhœa it does no good). Green bacillary diarrhœa is regarded as infectious and contagious, and lactic acid is advocated as a specific. Other acids, especially hydrochloric, have a certain value, but are inferior to lactic. The stools are sometimes neutral, sometimes feebly acid; in the latter instance they are so from mucus of the colon. One argument in favor of the acid treatment is that of fourteen autopsies made within forty minutes after death from this disease the only parts of the alimentary tract which were constantly acid were the mouth and the transverse and descending colon; the œsophagus and small intestine were neutral; the stomach variably acid, according to the amount of dyspepsia.

Shaw¹_{Aug.} also speaks favorably of the lactic acid treatment, which he has tried in about one hundred cases; no details are given.

Hayem makes an additional report,³⁸³_{Jan. 20},⁹_{Feb. 11} in which he states that further experience justifies his earlier conclusions.

Misrachi²¹²_{June 30} speaks highly of this treatment where stools are alkaline or neutral, but says it is useless if stools are strongly acid.

Hydrochloric Acid.—Moncorvo, of Rio Janeiro, corresponding editor, speaks enthusiastically of the use of this acid, especially in cases of lenteric diarrhœa. An examination of the contents of the stomach in these cases by the usual tests for HCl shows it to be very markedly diminished.

McLachlan²⁸⁴_{Feb.} praises the use of acids, particularly nitro-hydrochloric, which he has used for seven years in combination with small doses of opium with gratifying success. He gives one-third of a minim (0.022 gramme) every three hours to a child a year old.

Pfeiffer³⁶⁶_{Oct. 20, 11.2} controverts the idea that green stools indicate an abnormal acidity of the intestine. The intestinal tract in nursing children is acid throughout nearly its whole extent. Green stools depend upon increased alkalinity of the intestinal contents. Hence, he argues that *acids, and not alkalies*, are indicated in these intestinal catarrhs.

Calomel is well spoken of by most of the contributors of the year, both in the early stages as a purgative and later in small doses. Love,⁸²_{July}, Mettler,⁸²_{Sept. 15} and Goyard,²²⁴_{Mar. 21} speak highly of this drug.

Castor-oil is recommended by A. A. Smith²⁷¹_{Aug.} in an emulsion

with opium, in diarrhoea where the passages are small, bloody, and mucous—in other words, in dysenteric diarrhoea.

Antiseptics.—Baginsky⁶⁰_{Nov. 20, 21} has shown that outside the body the normal bacteria of the intestine will inhibit or prevent the growth of certain of the pathogenic varieties. He concludes that the same is true in the intestines, and that if, by anti-bacteriological treatment we could actually destroy existing germs in the intestine, which we certainly cannot safely do by any method now in vogue, we might do actual harm by destroying the normal bacteria here. These, he thinks, are the great protection to the intestine against the entrance of pathogenic bacteria at all times.

He condemns as irrational the indiscriminate administration of antiseptics. No real progress can be made until the nature of the different putrefactive processes in the intestine is understood, and the means of recognizing them clinically are at our disposal. Many drugs have great efficiency against certain forms of putrefactive changes, but are of little value in other varieties.

Baginsky has found that calomel, even when present in very small quantity, prevents the growth in gelatin of the bacterium *lactis aërogenes* (Escherich), and thinks this explains its well-known usefulness in sudden diarrhoeas depending apparently on fermentation of milk-sugar in the milk supply. He quotes Morax, who found that it had little influence on the fermentations of albuminous substances. Baginsky has experimented with various other drugs as to their effect upon the bacterium *lactis aërogenes*, and finds that benzoic acid, boric acid, and resorcin in the proportion of one to two hundred hinder its growth completely; iodoform restrains it, while naphthalin was without effect.

Vaughan⁹_{July} states that, in the curative treatment of summer diarrhoeas of infancy, the destruction of the bacteria causing the abnormal fermentation is a necessity. The first step is to withhold milk, the food upon which the bacteria thrive best. He made some experiments with various substances in vogue, as antiseptics in the treatment of diarrhoeal diseases, to ascertain their efficiency in preventing fermentation in milk to which tyrotoxin had been added. Proper control experiments were made in each instance. In each one two ounces of milk was used.

1. Pure milk, no poison at end of twenty-four hours, the bottles being kept at 98° F. (36.7° C.).

2. Milk and ferment, poison in quantity.
3. Milk, ferment, and one one-hundredth of a grain (0.00065 gramme) corrosive sublimate; poison present.
4. Milk, ferment, and one twenty-fourth of a grain (0.0027 gramme) corrosive sublimate; no poison present.
5. Milk, ferment, and five grains (0.32 gramme) sodium salicylate; no poison present.
6. Milk, ferment, and five grains (0.32 gramme) resorcin; no poison present.

Experiments made with the last two drugs showed that they were not efficient in smaller proportions.

7. Milk, ferment, and naphthalin, five grains (0.32 gramme); poison present.

The author inclines to the view that the sodium salicylate was decomposed by the free lactic acid in the milk.

Soluble antiseptics are useful, according to Escherich,³⁸⁶ for an effect upon the stomach, and, when given by injection, upon the large intestine. To expect any effect as antiseptics upon the intestinal tract when these are given by the mouth is a delusion. Of this class resorcin and benzoate of soda are recommended for the purpose indicated.

Insoluble antiseptics may be expected to produce some effect in the intestine; of these the best are naphthalin and *salicylate of bismuth*. This latter drug has been the subject of extensive experiment by Ehring¹⁵⁸ in all forms of diarrhoeal disease. It is administered in suspension, in doses of one to three grains (0.065 to 0.194 gramme) every two hours. He speaks favorably of his results.

Salicylate of sodium has been used by many writers with varying results. Starr¹³⁹ and Smith² have spoken specially in its favor.

Salol, so much praised last year, has been found by Christopher⁹ very uncertain, "occasionally doing all that could be expected, but much oftener not." Brothers⁸⁰ used salol in sixteen dispensary cases which were followed up. Only three were positively cured, while in the remainder the treatment had to be changed. No writers have said much that was favorable regarding the drug, excepting Osborne,¹ who reports its use in twenty-two cases (some were among adults). Nineteen of these

are reported cured by the drug. Three did not report subsequently. These cases seem to have been taken from private practice.

Resorcin has still its advocates and seems to hold its place. It is well spoken of by Escherich,³⁸⁶ by Carreras,⁵⁴⁰ ⁴¹ who reports eleven cases; by Jacobi,¹⁰⁸¹ and by Fliesburg.¹⁰⁶ Escherich and others have emphasized its toxic properties and have cautioned against its use in too large doses or indiscriminately.

Carbolic acid in one-fourth minim (0.016 gramme) doses every hour is favorably reported,¹⁸⁶ upon by Alford.

Sulpho-carbolate of Zinc.—Broughton¹²⁰ reports excellent results in fifteen or twenty cases, dose to infants one-sixth grain (0.011 gramme) to one grain (0.065 gramme) every two hours, given in combination with pepsin.

Naphthalin has been quite extensively used and many writers speak favorably of it, notwithstanding that both Vaughan and Baginsky found experimentally that its action in inhibiting bacterial growth is a very doubtful one.

Corrosive sublimate has been well spoken of by Baruch,⁹ and by Dessau,¹⁸⁹ both after quite extensive experience with it. Most other writers who mention this drug have found it disappointing their expectations.

Inert Powders in Large Doses.—Debove,³⁵ ²⁶ recommends talc (silicate of magnesia) in cases of chronic diarrhoea. He has used it with success in diarrhoea complicating tuberculosis, and suggests its use in infantile diarrhoea. To adults he gives two hundred to four hundred grammes (6 to 12 ounces) daily, suspended in milk. It is stated to be so light that it does not lodge in a dilated intestine, perfectly tasteless and unirritating, and not acted on by the digestive fluids.

Sevestre,⁶¹ has used this treatment in seven cases among infants. He did not give talc above one ounce (31 grammes) daily. In three cases there was a striking benefit and all were much improved and ultimately cured.

Quinine.—Moncorvo, of Rio Janciro, corresponding editor, believes that not a few cases of infantile diarrhoea depend upon malarial poisoning and are curable by quinine after resisting other methods of treatment.

Cold Baths.—Dessau,¹⁸⁹ uses baths of 60° F. (15½° C.) whenever the body temperature reaches 104° F. (40° C.). This is

continued for five minutes and the body rapidly dried and wrapped in a blanket. If there is a tendency to cutaneous congestion the bath is made shorter.

Comegys²⁷¹_{Aug.} gives the following indications for baths: High temperature, 102°–106° F. (38.9°–41° C.), and great thirst, intense restlessness, rolling of the head, and contracted pupils. The entire body is immersed for ten to fifteen minutes “in cool or even cold water.” Baths should be repeated every three hours.

The systematic use of cold bathing is strongly urged,⁸⁰_{July} to be used every two to eight hours according to circumstances. It is indicated whenever the temperature is elevated.

Stimulants.—While almost all writers advise them, and strongly, too, sufficient consideration is not always given to the choice of preparations. Epstein³⁰⁶_{Ed. 27, H. 1, 2} calls attention to the fact that wines, particularly red wine, are to be avoided in all acute catarrhal conditions of the stomach from the readiness with which fermentation takes place.

Copious Draughts of Water in Cholera Infantum.—This practice is strongly recommended by Hendrix,⁸²_{June}, Love,⁸²_{July}, and by several others in a discussion⁷²_{Aug.} of the Tri-State Medical Society. Hendrix advises ice-water, which the child is allowed to drink freely. This is soon vomited and more is taken. By this means the stomach is washed out completely and fluids are supplied to counterbalance the drain of the diarrhoea. After a little the stomach becomes tranquil and food and medicines can be retained. The results in the cases reported add emphasis to the author's statements of the value of this method of treatment.

Subcutaneous Injections of a Saline Solution in Cholera Infantum.—Henoch,⁴_{Nov. 26} reports great benefit derived from this measure. He begins with a 2 per cent. solution, 9.6 grains (0.62 gramme) to the ounce, and afterward uses a 0.6 per cent. solution, 2.9 grains (0.19 gramme) to the ounce, of this six or eight large Pravaz syringefuls being injected at a time, and this is repeated at short intervals. This was used for the most part in cases already in a condition of collapse, and gave much better results than the use of stimulants hypodermically.

Cocaine.—Strom¹⁹⁹_{Aug.} reports upon five cases treated by cocaine, one-sixteenth of a grain (0.004 gramme) being given every six hours to a child of a year, and the dose gradually increased to

one-eighth of a grain (0.0081 gramme). Only one proved fatal. Details are, unfortunately, not furnished.

Morphine and atropine hypodermically in cholera infantum are highly spoken of by Love⁸²_{July 7} and Rosser,²²⁴_{Mar. 17} but full details are not given of the cases mentioned, so that very little that is accurate is yet established upon this point. The doses mentioned by the above writers are one-sixtieth (0.00108 gramme) to one-eightieth of a grain (0.0008 gramme) morphine to one three-hundredth (0.00022 gramme) to one hundred and fiftieth (0.00043 gramme) of a grain of atropia.

INFANTILE CONSTIPATION.

Eustace Smith²_{July} classifies the causes of infantile constipation as follows:—

1. *Foods*.—Any which contain an excess of starch, or which leave a very large residue of undigested material. This results, if long continued, in a mild intestinal catarrh, with excessive production of mucus, which coats the faecal masses so that they afford no sufficient resistance to the muscular contractions of the bowel.

2. *Dry Stools*.—In this variety the stools are often only dry, round balls. It results from an insufficient supply of water with the food. As a secondary result in this class of cases we have distention of the colon, loss of muscular tone, and pain on defecation, which last may of itself become a sufficient cause for inactivity of the bowels.

3. *Opium*.—This should always be suspected when children are left much to nurses and when associated with drowsiness, loss of appetite, and contracted pupils.

In some cases there seems to be no inconvenience from the absence of regular evacuations; in others there is colic, straining efforts, and the usual signs of indigestion. The straining may cause hernia.

In the treatment, the author states that a teaspoonful of syrup three or four times a day before nursing is often sufficient to overcome the difficulty in young infants. In dry stools, water should be given, especially when urine at the same time is scanty and high colored. If a mild intestinal catarrh is present, depending on an excess of starch, the diet must be corrected. Catarrh may be often arrested by proper covering for the abdomen. Malted foods and malt extracts added to milk are good in these cases. Abdominal

manipulation should be made whenever sluggishness of muscular contraction exists.

Injections and suppositories are useful for temporary relief only. They should not be continued a long time. Good results from a drachm (3.9 grammes) injection of pure glycerine are reported.

In the use of drugs, the aim is to find the smallest daily dose which will produce an evacuation. A useful draught is

R. Tr. nux vomica,	M $\frac{1}{2}$ (0.032 gramme).
Tr. belladonna,	gtt. 10 (0.65 gramme).
Infus. senna,	gtt. 20 (1.3 grammes).
Infus. calumba,	gtt. 40 (2.6 grammes).

This is taken first three times daily, and later only twice or once. (It should be remembered that the English tincture of belladonna is less than one-half as strong as that of the U. S. P.).

Another useful remedy is cascara sagrada. It is especially useful in combination with belladonna.

When stools are dry, sulphate of soda in ten-grain doses (0.65 gramme) is useful, especially so when combined with the tincture of nux vomica, half a drop; quinine, one-fourth grain (0.016 gramme); and aromatic sulphuric acid, one drop in water, this being a dose for an infant of six months.

Weaver ²²_{Aug. 18} criticises the prescriptions above given as being all of them unnecessarily nauseous, and the amount of belladonna—i.e., gtt. 10 (0.65 gramme) three times a day—too large for continuous use. He thinks proper feeding sufficient to cure most cases of constipation. He gives castor-oil when necessary to produce a single evacuation and follows up with manna for some time.

Jacobi ⁵¹_{Feb.} mentions, among dietetic causes of constipation, too much casein (cows' milk), too much starch, too few salts, and too little sugar. The first is remedied by properly diluting the milk, best by oatmeal decoction. In regard to the advantage of giving sugar and plenty of water under appropriate circumstances, he agrees with Eustace Smith.

The association of constipation with debility of the muscular coat of the intestine from rickets he calls attention to, and states that if cod-liver oil is given under these circumstances the common addition of phosphate of lime is improper.

The combination of cascara and nux vomica is also well spoken of ¹³²_{Nov.} for atonic constipation and sulphate of magnesia where

dry stools exist, two grains (0.13 gramme) to five grains (0.32 gramme) being given largely diluted.

The use of glycerine suppositories or injections is favorably spoken of here and elsewhere by various writers, one drachm (3.9 grammes) being the maximum dose required, and the inconvenience from its use being very slight.

Hirschsprung ³⁶⁶_{84, 87, H. 1; J. 90} reports two cases of constipation depending upon congenital dilatation and hypertrophy of the colon.

The most obstinate constipation had existed from birth. In one case, though there was no action from aperients, enemata brought away large amounts of fæcal matter. When seen by the author there had been no movement for fourteen days, yet the appetite was good, and, except for occasional vomiting, the health was good. The abdomen was full and rounded; the rectum full of scybalæ. During a hospital stay of two months, under the continued use of laxatives and enemata, there was improvement, and the bowels were moved regularly. After removal, however, diarrhœa set in, the stools being thin, watery, and frequent, and death occurred from exhaustion at eleven months of age. The transverse colon was the seat of enormous dilatation and its muscular coats much hypertrophied; the mucous membrane was eroded and ulcerated. There was no rectal stricture, and the small intestines were normal.

In the other case reported there was also constipation from birth, and the bowels acted only by enemata. Death occurred at nine months in this case also, from diarrhœa and exhaustion. The colon was greatly dilated and its walls ulcerated. The ulceration in both cases appeared to be secondary to the dilatation. The dilatation was believed to have existed from birth and due to some anomalous development, or perhaps disease of fœtal life.

INFANTILE ATROPHY.

Bohn ³⁶⁶_{84, 87, H. 3; J. 90} defines this disease to be the result of continuously insufficient nutrition of the child's body, deficiency in the means of supplying the natural waste of tissue and fresh material for tissue formation. It differs from dystrophy or faulty nutrition, in which certain elements are in excess, as in rickets. It resembles anæmia, but is more comprehensive. The cases occur within the first four months of life. The clinical picture covers: 1. Intestinal

catarrh, which, while not constant, as claimed by Parrot, is very easily set up. 2. Loss of weight, principally due to loss of fat, to a less degree of albuminous elements of the body. 3. Œdema of the skin and transudation into the cavities of the body are wanting. The blood, like the solid tissues, is poor, but not by dræmic. 4. The cranial bones are always hard, contrasting with the cranio-tabes seen in rickets at the same ages.

The lesions found at autopsy are mainly atelectasis in the lungs; thrombosis in the veins; catarrhal and follicular inflammations in the intestines and occasionally evidences of bronchitis and pneumonia.

Bohn takes strong ground against the view advocated by Nothnagel and Baginsky that these cases (at least a considerable proportion of them) are due to atrophy of the intestinal mucous membrane. He concludes: "Atrophy of the intestinal mucous membrane does not underlie general atrophy, and as yet we know of no organic changes upon which pure infantile atrophy depends.

Under the name of *athrepsia* Séjournet,¹¹⁸_{June, July} describes the same affection and gives a good clinical picture of the disease without throwing any new light on pathology or treatment. Three periods of the grave variety are distinguished: (1) one marked by indigestion and green diarrhœa; (2) vomiting, thrush, erythema of buttocks, etc., etc., emaciation; (3) cachexia and death from exhaustion or complications.

The rapid form is the most common, lasting three to six weeks. In the slow form it may last for several months.

The mortality is very great.

The lesions are those of a "violent gastroenteritis, ulceration, softening, ecchymoses, and granular infiltration of the mucous membrane." In the later stages come thromboses, hæmorrhages, and steatosis of the lungs, kidneys, liver, and brain.

One looks in vain in either of these articles for points of differential diagnosis between this affection and tuberculosis, a subject upon which light is very much needed.

INTUSSUSCEPTION.

Treatment by Inflation.—Cheadle,⁶_{Feb. 18} reports a successful case in a child fifteen months old. The symptoms were of fifteen hours' duration, and the tumor was felt per rectum. He speaks

of this as the third case in succession which had been reduced by similar means.

Higginson⁶_{May 19} reports another successful case by the same method, the symptoms being of three days' standing. The patient was seven months old and the tumor could be felt per rectum.

Injection of Liquids.—Goodhart⁶_{Feb. 25} reports a case cured by injecting a boracic acid solution seventy-six hours after the first symptoms; the child was eight months old and tumor felt per rectum.

Butler¹⁵⁷_{Feb.} reports a successful case in a child three years old by injection of water thirty-six hours after the onset.

Humphreys⁶_{Oct. 22} adds two more cases of recovery by this method. One, in a child two years old, was reduced easily by injection after thirteen hours' symptoms. A localized pain in the right iliac fossa persisted for some time afterward and was accompanied by slight swelling. This was believed to be due to localized colitis.

In the second case reduction was easily accomplished by injecting water forty hours after the first symptoms. The child was eight months old.

Chaffey⁶_{July 7} reports an unsuccessful case. It was somewhat chronic in character and the tumor intermittent. The autopsy showed the cæcum and vermiform appendix to be inverted. Old inflammatory bands were found in the neighborhood.

Harrison Cripps²_{June 2}, in a discussion before the Clinical Society of London, reported a case of rupture of the intestine from injections in a girl eighteen months old. After four or five days of symptoms, the tumor at this time projecting from the anus, water was injected slowly, the tumor receding. Suddenly the child became faint, vomited, and died in a few minutes. A large rent was found in the bowel just below the tumor, a quantity of fluid having escaped in the peritoneal cavity.

R. W. Parker²_{June 2} also called attention to the danger of injecting water except in the early stage.

Lucas¹⁵⁸_{Ed. 9, H. S.}⁵¹_{Aug.} prefers the inflation with air to injections of water as being just as effectual and much less likely to cause rupture. Inversion of the patient is a valuable adjuvant to inflation.

Cripps²_{June 2} mentioned a case of spontaneous cure by sloughing in a child seven months old, who was brought by the mother with

a history of two weeks' illness, in which there had been vomiting and passages of blood and mucus. Something was protruding from the anus, which, on being quietly drawn out, was seen to lead to what looked like healthy intestine. The slough was cut off and the child admitted. Every day for a month thereafter a piece of this extended slough was removed. The child recovered perfectly, but died eight months afterward of scarlet fever. At the autopsy there was found *complete absence of the whole large intestine*, the small intestine being attached directly to the anus.

R. W. Parker,² reports two fatal cases of intussusception, aged three and four months respectively, and draws attention to the uncertain onset in the cases and the absence of symptoms of acute strangulation, such as the autopsy showed to have been present. The pain was not excessive and was of short duration; vomiting occurred only during the first twelve hours and then only after nursing; there was never any straining or tenesmus and only a small amount of blood and mucus discharged. Constipation was the most important symptom. The speaker stated that the absence of the classical symptoms was to be looked upon as a bad rather than a good sign in cases where a pretty positive diagnosis of intussusception had been made out. It indicated usually a gangrenous intestine.

TUBERCULOSIS OF INTESTINES AND MESENTERIC GLANDS WITH THROMBOSIS OF THE INFERIOR VENA CAVA.

Ollivier,⁷³ reports the case of a girl eight years old which presented some unusual features. After a chronic diarrhœa had lasted for two or three months, œdema of the right lower extremity was noticed, and a few days later the left was similarly affected. There was no evidence of tuberculosis in lungs, heart, or brain, but one other child in the family had died of tuberculosis and this diagnosis was reached in the case by exclusion. Death occurred from exhaustion two months after the œdema developed.

The autopsy showed, besides deposits in the lungs, extensive tubercular ulcers in the small intestine, tuberculosis of mesenteric glands, and one large carious mass in the mesentery measuring ten centimetres in each direction. There was thrombosis of the inferior vena cava, which was believed to be of mechanical origin from the pressure by the tumor.

ANIMAL PARASITES AND THEIR EFFECTS.

By JOSEPH LEIDY, M.D., LL.D.,

AND

CHARLES S. DOLLEY, M.D.,

PHILADELPHIA.

GENERAL.

THE interesting Bowman Lectures delivered in London by von Zehender, ⁶⁹_{No. 50, 87} on "Parasitical Diseases of the Eye," contained a summary of the present condition of our knowledge of the animal and vegetal parasites of the human eye and the diseases produced by their presence. Prof. v. Zehender first dealt with the improved methods of investigation, then with the as yet uncorroborated observations concerning *Mono-* and *Distoma*. *Filaria* and *Echinococcus* were treated of. *Cysticercus* seems to have been most often observed as a parasite of the eye, varying in frequency according to geographical distribution, thus: Berlin and Halle give one *Cysticercus* to one thousand patients, Stuttgart one to forty thousand, Paris one to sixty thousand, Copenhagen one to seventy thousand, while in Belgium the first and only intra-ocular *Cysticercus* was seen in 1885. The lectures closed with considerations of the wandering and growth of parasites, as well as the changes induced in the eye that harbors a parasite and the operative procedures for the removal of the same.

Raphaël Blanchard ¹⁰⁵⁷ presents in a most interesting and lucid manner some of the more important human parasites, their occurrence, development, and the sources of infection. The forms considered are *Ascaris*, *Pentastoma*, *Tænia*, *Bothriocephalus*. The classification is based upon method of infection.

PROTOZOANS—INFUSORIAL PARASITES.

E. Perroncito, ⁵⁰_{v. 4, p. 10} in a communication to the Royal Academy of Medicine, at Torino, gives the results of his studies on the way in which the infusorial parasite of man and animals, *Cercomonas intestinalis*, is spread from one host to another. He finds that at

a certain period of its life it alters its form, loses its flagellum, and becomes encysted. These encysted specimens become scattered in the faeces, and later on assume the flagellate form when taken into the alimentary canal of some animal or man in water or upon plants.

TAPE-WORMS—CESTODA.

One of the most notable contributions¹⁰⁵⁸ of the year to the literature of helminthology is Bérenger-Féraud's new work, which covers the history, synonymy, classification, and description of the divers species of *Tænia*, with a very complete bibliography. The reader is made acquainted with the variability of these parasites, their divers aspects and singular metamorphoses, while some of the rarer aberrant forms are noticed as curiosities. Special attention is drawn to the rapid spread of *Tænia saginata* over western Europe, where it was formerly unknown. Statistics show that it has progressively taken the place of *Tænia solium* throughout the greater part of Europe. The latter is still to be found in Russia, Germany, Denmark, and Holland, but rarely, the territory being disputed by *Bothriocephalus latus* and *Tænia saginata*, the latter showing a predominance in statistics.

In Switzerland *Bothriocephalus* dominates, while Austria, where forty years since none but *Tænia solium* were encountered, now presents frequent examples of *Tænia saginata*.

This rapid diffusion of the unarmed *Tænia* is attributed, in so far as France is concerned, to return of soldiers from the Chinese and Syrian expeditions and to the importation of beef and livestock from the Mediterranean basin, Africa, Egypt, and Syria. The endemicity of *Tænia solium* in Germany is due to the practice of eating insufficiently cooked pork. A very complete account of the natural history of *Tænia* is given, based upon a survey of the work of modern naturalists and clinicians.

The hygienic bearings of the parasite are discussed in full, followed by three lessons on symptomatology, and all should read the work who desire a complete account of the troubles arising from the presence of a tape-worm in the intestine.

G. Treille,¹⁹⁵ in reviewing the work, thinks the author would have done well by adding to his classification of accidents due to *Tænia* various trophic troubles, such as emaciation, and cutaneous eruptions (eczemas, herpes circinata, pemphigus, etc.); and cites a

case of eczema of the scrotum that resisted all treatment, but disappeared after the exhibition of a dose of pelletierine and evacuation of tape-worm.

Nearly half of M. Bérenger-Féraud's book is taken up with the therapeutics of the subject. A conscientious revision of all known tæniacides or tæniafuges is given, and special attention called to the sulpho-tannate of pelletierine, the medicine of his choice, to be used in all cases, except (1) in individuals of great nervous irritability, (2) in pregnancy, (3) in very young children. In order to combat the muscular paresis of the intestine due to the action of pelletierine he frequently gives a half hour or an hour before an infusion of ten to fifteen grammes (2.5-4 drachms) of senna-leaves, sweetened with thirty grammes (1 ounce) of syrup of bitter orange-peel. The tæniafuge potions of pelletierine consist of

Sulphate of pelletierine, . . .	30 grammes (3 1),
Tannin,	1 to 1.50 grammes (gr. 15.23),
Sweetened water,	20 grammes (3 5),

which corresponds closely with Tanret's formula. The potion should be mixed with an equal bulk of water. The patient takes at first half, the other half in from ten to thirty minutes, at once, or in separate doses. To prevent vomiting he should remain lying down. The purgatives should be given half an hour after the last of the pelletierine. Bérenger-Féraud uses twelve to fifteen grammes (gr. 185.19 to gr. 231.49) of German brandy and thirty to fifty grammes (gr. 462.97 to gr. 771.62) of castor-oil in capsules or emulsion. Evacuations should be made in a vessel half filled with water.

D. A. Kessler is the quoted ⁶authority for statistics regarding the relative frequency of entozoa in St. Petersburg and Munich. The percentage of cases in which worms were found in St. Petersburg is 43.75 per cent., in Munich 38.88 per cent. In St. Petersburg the percentage of *Oxyuris* was 13.94 per cent., in Munich 30.15 per cent. *Bothriocephalus* in St. Petersburg 8.17 per cent., in Munich none; of *Tænia solium* the cases in St. Petersburg amounted to 2.5 per cent., while in Munich it did not occur in more than 0.5 per cent. of the cases. These statistics agree with those in Bérenger-Féraud's work. According to Hirsch, 15 per cent. of the population of Western Russia is afflicted with *Bothriocephalus lata*.

The frequency with which tape-worm is met with in Algeria

is well shown by the following^{1050, 12 July} quotation from Badour's work: "In Algeria nobody is sure that his intestines are not infested by the parasite. That is, to put it mildly, saying that it is very common; and in spite of the fact that pork is used less there than anywhere else, and scarcely any rare meat is ever eaten. The fact is that every blade of grass is infected with ova, the earth and the air being filled with them by the shameless filth of the Arabs. They deposit their excrement and waste of all descriptions upon the soil and thus fructify it. There is no such thing as sewage."

At a meeting of the Anatomical Society of Lille a complete specimen of *Bothriocephalus latus* was presented by Guermonprez,^{220 Feb. 10} being the second specimen on record for that city. The patient had not visited any of the districts of Europe in which *Bothriocephalus* is prevalent (Switzerland, Russia, Holland), and the origin of the parasite was unaccounted for. The theory of Bérenger-Féraud, referred to above, would seem to cover the case, i.e., the importation of live-stock from the Mediterranean basin into France, the patient having traveled about in that country.

Veterinary Surgeon Bascou,^{164 Sept. 9} after remarking that nearly all the cases of tape-worm observed in the hospitals of Paris are due to *Tenia saginata*, and that each summer shipments of Algerian cattle are made to Paris which are frequently infested with *Cysticercus bovis*, to which the above fact is solely due, proceeds to place on record the first instance in which a *Cysticercus bovis* has been found in native French cattle, the animal in question having been of the Bernois breed.

According to the experience of A. D. Stevens,^{180 Sept.} tape-worms are exceedingly rare in the country districts of Canada.

Prof. W. T. Plant,^{51 Aug.} of Syracuse, N. Y., in an exceedingly lucid and concise article on intestinal worms, points out the fact that tape-worm is much more common in the young than is generally taught. He presents two cases of his own in boys of two years, and refers^{50 77} to a case in a child two years old, two cases,^{50 77} one three years old, the other twenty-two months; to four cases^{50 78} in children ranging in age from six months to nine years; to an instance^{80 78} of tape-worm in an infant seven months old; to another case^{51 78} in an infant five months, and one^{50 71} in an infant five days old.

W. W. Ransom,^{6 July 21} calls attention to the fact that he figured certain ova,^{680 v. 1, 76} which correspond exactly, according to Grassi's

description,¹⁰⁰⁰ with the eggs of *Tæni anana*. Grassi holds the ova described and figured by Dr. Ransom as those of *T. nana*, the worms having been overlooked, when evacuated, from their minute size.

F. Zschokke,⁵⁰ adds, by his investigations, one to the list of fishes that act as hosts for the larvæ of *Bothriocephalus latus*. The list up to date stands as follows: *Esox lucius* (Pike), *Lota vulgaris* (Burbat), *Perca fluviatilis* (Perch), *Oncorhynchus perryi*, *Salmo umbla*, *Trutta vulgaris*, *Thymallus vulgaris*, *Trutta lacustris*.

TREATMENT OF TAPE-WORM.

The following tæniacide and tæniafuge¹⁴⁵ is given by Blotte:—

Sulphate of strychnia,	0. gr. .005 milligram (gr. $\frac{1}{200}$).
Gamboge,	0. " .100 " (gr. $\frac{1}{10}$).
Pulverized scammony,	0. " .200 " (gr. 3).
Calomel,	0. " .300 " (gr. $\frac{1}{2}$).
Acetic extract male fern,	2. " " (gr. 31).

Make into two masses, to be taken with an interval of a quarter of an hour.

Béranger-Féraud⁶⁷ considers the influence of purgatives in the treatment of *Tænia* with pelletierine. Having experimented extensively with the drug, both alone and without purgatives, he decides that its action is doubled by the employment of a purgative. In choosing a suitable purgative he objects to the use of salines, as causing a serous flood of the intestine and a consequent dilution of the tæniacide. Calomel, croton-oil, jalap, scammony, and aloes were all rejected after trial and preference finally given to German brandy.

On comparing this with castor-oil, he finds that German brandy has an efficacy greater than castor-oil in the proportion of 63.54 to 100; in other words, in one hundred cases German brandy offers nine chances of success more than castor-oil. Attention is again called this year by several journals,²⁴ to the use of mignonette as a vermifuge in Russia, where it is employed for the expulsion of *Tænia*.

Parisi,⁶ of Athens, when in Abyssinia, discovered that the cocoanut possesses vermifugal properties, which later experiment confirms. His observations in Athens showed that after the administration of the milk and pulp of one cocoanut, early in the morning, fasting, the entire worm was in every case expelled dead, without the necessity of confining the patient to the house, or the administration of purgatives.

J. F. Jenkins,⁶¹_{Mar. 24} having failed to expel the entire tape-worm in the case of a boy thirteen years old, after employing turpentine, pomegranate-bark, pumpkin-seed, extract of male fern, and chloroform, finally resorted with complete success to the use of salicylic acid in eight-grain (0.52 gramme) doses every hour until five doses had been taken, the last dose being preceded and followed by a dose of castor-oil. A writer¹⁰ recommends the following treatment for tape-worm:—

Chloroform,
 Extr. male fern, āā 3 1 (3.89 grammes).
 Emulsion of castor-oil (50 per cent.), . 3 3 (11.66 grammes).

Sig. : All to be taken at once after twenty hours' fast.

In every case the worm was expelled entire, the result being the same when the male fern was omitted.

Bartholow is quoted¹³⁰_{Mar.} as recommending the following method of administering pomegranate-bark for *Tænia solium*: Phosphate of soda is to be exhibited in decided doses in the intervals of digestion for a few days, and followed by an active purge, after which is given pomegranate-bark, four ounces (124.4 grammes); water, two pints (941 grammes), boiled down to one pint (498 grammes).

The following convenient method of administering the oil of male fern is also recommended¹⁷_{May 10}:—

Ethereal oil of male fern, ℥ 45 (3 grammes).
 Tinct. vanillæ, ℥ 45 (3 grammes).
 Syr. rubi, 3 6½ (23 grammes).
 Gum. acac. pulv., gr. 30 (2 grammes).
 Aquæ destill., 3 6½ (23 grammes).

To be taken at one dose, in an equal quantity of milk.

Castor-oil should be taken two hours afterward.

Schaffint's remedy for tape-worm is recommended by Gerhard⁶²_{July}, as having been in every case successful and as having the peculiarity that the worm is voided entire, "with its head fastened to the side of its own body."

R Granati cortici radices, 3 ½ (15.55 grammes).
 Seminorum peponis, 3 1 (31.10 grammes).
 Pulveratis ergotæ, 3 1 (3.89 grammes).
 Aquæ bullientis, 3 8 (248.82 grammes).

Fiat infusum.

R Extracti flicis maris ætherici, f3 1 (3.89 grammes).
 Olei tiglii, ℥ 2 (0.14 gramme).
 Pulveris acaciæ, 3 2 (7.73 grammes).

Fiat emulsio.

Mix the emulsion with the infusion for one dose, to be given at ten o'clock in the morning, the patient having eaten no breakfast, and having taken a full dose of Rochelle salts the previous evening. The attention of physicians is again called to the new remedy for tape-worm, *Embelia ribes*. (See ANNUAL of 1888, vol. i, p. 383.) The drug is indigenous to Ceylon, is a large woody climber called *Wel-Embilla*, the seeds being sold in local markets under the name of *Walingasahl*. It has been used successfully in London when all the common remedies had failed. An active principle, *Embelin*, has been isolated¹⁷⁴_{Aug.} by Dr. Warden.

CYSTICERCUS.

The attempt made last year by E. Gavoy, and noticed on page 387, vol. i, of the ANNUAL, to prove that the *Cysticercus cellulosæ* of measly pork is not the larva of the common tape-worm, *Tænia solium*, meets with strong opposition. Raphael Blanchard¹⁸⁸_{Mar. 11}; ²_{Mar. 24} quotes the experiments of Aloys, Humbert, Küchenmeister, Hollenbach, and Heller as proving beyond question that the *Cysticercus* of pork measles develops into the *Tænia solium* when taken into the human intestine, and that the length of the hooklets is of no diagnostic value. Dr. Gavoy²¹¹_{Apr. 1} takes exception to this, and insists that while these investigations have proven that we are able to produce a particular *Tænia*, they have not proven that the head of the *Cysticercus* of man, although it resembles that of *Tænia solium*, is identical with that of *Cysticercus cellulosæ*; that they have not proven that *Tænia solium* proceeds *exclusively* from the *Cysticercus* of pork, and, finally, that they have not proven that the *Cysticercus* of the unarmed tape-worm (*Tænia saginata*) may not exist in man.

To this Dr. Blanchard replies²¹¹_{Apr. 1} that the presence of pigment in the scolex or head of *Tænia solium* has no specific value, inasmuch as certain tape-worms (*e.g.*, *T. saginata*) are known, which, though normally colorless, have been noticed of a deep black, *Tænia nigra*, described in 1875 by Professor Laboulbène, being nothing more nor less than a *Tænia saginata* afflicted with melanosis. Furthermore, that the length of the hooklets not being fixed in *Tænia*, but varying over a larger scale than the difference upon which Dr. Gavoy denies the identity of *Cysticercus cellulosæ* and the larva of measly pork, shows the folly of the denial.

Dr. Gratia²⁸⁸_{Feb. 28} presented to the February meeting of the *Société Anatomopathologique de Bruxelles* specimens of *Cysticerci cellulosa* from the brain of a child of eight years, one from the second right frontal convolution, the other from the gray substance at the base of the Island of Reil. Not a single nervous symptom had entered into the case, due to the presence of the parasite in the brain.

O. Bollinger³⁴_{July 21} publishes a lecture on *Cysticercus cellulosa* in the human brain. He refers to the relative frequency of different species of tape-worms in Munich. Out of twenty-five cases, *Tænia solium* occurred once, *Tænia saginata* sixteen times, and *Bothriocephalus latus* eight times. The rarity of the armed *Tænia* he attributed to the fact that raw pork is not much eaten in and about Munich, and that the oversight of the slaughter-houses is very exact. He, however, reports two cases of *Cysticercus cellulosa* in the brain, one in the fourth ventricle, the other on the convex surface of the right frontal lobe. Out of more than fourteen thousand dissections, extending over a period of thirty-five years, these two instances are the only ones recorded for Munich, while in Berlin, according to Dressel,¹⁰⁶¹₇ out of five thousand three hundred dissections seventy-two instances of *Cysticerci* in the brain were found. In the discussion following Dr. Bollinger's lecture Dr. Vogel remarked that in twenty years' practice in Dorpat he had found but one case of *Cysticercus*, there being, however, thirty or forty specimens in the brain.

Dr. Stintzing confirmed the statement as to the rarity of *Tænia solium* in Munich, the few cases he had seen being those of strangers to the locality, not natives. He had one case, however, from which he secured two worms, one *T. saginata* and one *T. solium*.

Surgeon H. Armstrong,²_{Nov. 21} of the government Lunatic Asylum, Madras, reports a case of *Cysticercus cellulosa* in the brain, which is chiefly interesting on account of the rarity of this parasite about Madras. The case was that of a native coolie, who was sent to the asylum a harmless imbecile, suffering from right hemiplegia. Several cysts were found in the ventricles and in the gray and cortical structures of the brain, one in the ventricle of the heart, and two on the pleura of the right lung, the other organs being healthy and free from cysts.

Schaitter¹¹³_{Apr. 3} demonstrated at the February meeting of the Medical Society of Krakau, the nerves and muscles of a woman who had died in the hospital. In nearly all the organs were found distributed an enormous number of *Cysticerci cellulosa*, especially abundant in the brain cortex. The entire absence of any lesion indicated that death was due to the parasites.

Kahler⁵⁴_{Apr.} demonstrated to the Society of German Physicians in Prague the case of a twenty-three-year-old servant-maid who had suffered for three years with heavy periodical headaches, at first of a purely cephalalgic character, but later with paræsthesia in connection with the left extremities, nausea, and vomiting. On being taken into the clinic great anæmia and a splenic tumor were found. Ophthalmoscopic examination demonstrated choked papillæ on both sides, which indicated with certainty the existence of an intercranial tumor. A careful examination of the skin brought to light numerous hard, painless lumps about the size of a bean in the subcutaneous connective tissue of the sternal side of the thorax, the neck, shoulders, and region of the biceps; one of the lumps upon being removed was recognized as a *Cysticercus* cyst. A doubtful prognosis was given, as no means are known of killing the parasites. Autoinfection was believed to have occurred in this case. A case of operative removal of *Cysticercus taeniæ medio-canellatæ subconjunctivalis*, and another of the *Cysticercus* of *Tœnia solium* causing purulent iridocyclitis, is reported⁶⁰_{Nov. 1} by Dr. Deutschmann.

ECHINOCOCCUS TUMORS.

Four cases of *Echinococcus* cysts in the thigh⁶⁰_{Aug. 3} are reported. Grossich⁶²²_{Aug.} reports a case of *Echinococcus* cyst of the spleen.

Several dissertations⁵⁰_{Bel. A. No. 3} on *Echinococcus* by students of medicine in German universities deal mostly with statistics of the occurrence of the parasite.

FLUKE-WORMS—TREMATODA.

Virchow, having spent the early part of the year up the Nile, is reported by a correspondent²_{May 12} as having devoted himself, upon his return to Cairo, to stimulating the authorities to a systematic examination of the habitat of the *Distomum (Bilharzia) hæmatobium* and the manner in which it gains entrance to the human body. If it could only be known where the 63 per cent. (according

to Bilharz and Meckel) of Fellahs and Copts derive these parasites, something might be done toward reducing the evil. Virchow's reports were, of course, made toward this end, and he was greatly interested to learn of the success that has followed the treatment of the so-called *Bilharzia* by Fouquet, of Cairo, with the extract of male fern.

Allen, of Pietermaritzburg, shows that hæmaturia is practically confined to those that bathe, and especially to boys. He holds that the entrance of the parasite¹⁰⁸² (*Distomum hæmatobium*) is by the urethra. The question as to the means by which the *Bilharzia* (*Distomum hæmatobium*) gains entrance to the circulation is discussed by C. T. Dight, of Beirut, Syria,⁴⁰² in a most able paper, in which he gives a lucid exposition of the present state of our knowledge of *Distomum hæmatobium*. He quotes Dr. Harley as suggesting that it finds its way through the urethra into the bladder, where it colonizes; but offers to this theory the objection that under such circumstances it is probable a man infected with the parasite would infect his wife, "which did not occur in a man who passed from his bladder numbers of ova every day of his married life, and who had four healthy children."

Harley's second suggestion, that it sometimes gains admission through the skin by the minute animal becoming attached to a person bathing and depositing its eggs in a superficial vein, is met with the objection that the parasites should, under these circumstances, certainly be found in the general circulation, but are said only to be found in the portal circulation. Dr. Dight suggests that the adult parasite may be taken into the alimentary tract in drinking-water and may enter the portal circulation directly by means of ruptured vessels in abraded portions of the intestinal wall, dysentery being prevalent in those districts in which the parasite abounds. Escape from the portal system would be prevented by the hepatic capillaries, but the middle and inferior hæmorrhoidal veins offer an exit by way of the internal iliac, and Dr. Dight suspects that more careful investigation would discover the parasites in the general circulation, the ova having been already found in the lung-tissue. He refers, also, to the theory of an intermediate host. In regard to treatment, he proposes the injection of large amounts of sulphuretted hydrogen and carbonic dioxide into the rectum and bladder, since the gases named would

be absorbed directly into the hæmorrhoidal, vesical, and mesenteric veins, and meet the parasite there, probably without injury to the patient, since they enter at once the portal circulation, are carried to the right heart and to the lungs, where they are largely eliminated without passing on and entering to any extent the arteries of the systemic circulation. Almost unlimited amounts of these gases could in this way be brought to bear upon the *Bilharzia*.

Gustav Fritsch,²⁹ presents a very complete monograph on the anatomy of *Distomum (Bilharzia) hæmatobium*. Materials were secured for him by Prof. Robert Koch in Egypt while investigating the cholera epidemic of 1883.

As compared with *Trichina*, statistics prove this *Distomum* to be much less destructive to the human race. All the evidence points to one conclusion, i.e., that the parasite enters the system by means of impure water, particularly from stagnant lakes. As to the existence of an intermediate host, Fritsch is able to give no information.

An Italian correspondent,² calls attention to the discovery by Grassi and Rovelli that *Distomum (Bilharzia) crassa* (Sousins) is present in 75 per cent. of the sheep raised in the *Piana* of Catania. It is supposed that this parasite may have been introduced into Italy by the Italian soldiers returning from Massowah, as heretofore it has been unknown in Europe; its geographical distribution being Cape of Good Hope, Brazil, Egypt, Mauritius.

Prof. Isao Ijima,⁵⁰ in notes on *Distoma endemicum*, asserts the identity of *Distoma endemicum* and *Distoma perniciosum*, but still leaves in doubt the identity of *Distoma endemicum* and *Distomum sinense*. *Distomum endemicum* is frequently found in the human gall-duct, among the inhabitants of the Province of Okayama, in Japan, about 20 per cent. of the inhabitants of villages in this district being infected. Dr. Ijima was unable to discover any evidence that the intermediate hosts of this parasite belong to the mollusca, although the probabilities pointed that way. He gives a concise description of the anatomy of *Distoma endemicum*.

THREAD-WORMS—NEMATODA.

Adolph Lutz⁵⁰ contributes a series of articles on the question of the transference of the *Ascaris lumbricoides*. He cultivated the eggs of this human parasite in various culture fluids and found

that if the embryos were introduced into the intestine, while still covered with the mulberry-like egg-shell, the person became infected; if, on the other hand, the process of development had reached a stage at which this hull was ruptured or lost, the embryo parasites, unable to withstand the action of the digestive fluids, failed to infect the patient.

Jabez Hogg,²_{July 2} after referring to the frequency with which strabismus in young children is due to the irritation produced by intestinal worms, presents the details of a case in which a three-year-old girl was suffering from associated reflex amaurosis and strabismus. She had exhibited none of the characteristic symptoms of worms, but upon being treated with anthelmintics passed a large number of *Ascarides*, *Oxyurides*, and a tape-worm. A rapid recovery of sight followed, strabismus disappeared, and a marked improvement of general health, intelligence, and power of speech resulted.

Cases of *Ascaris lumbricoides* causing convulsions are recorded by George Tandy Wilkinson,⁶_{Feb. 4} by Beaven Rake,²_{Nov. 2} and by Stanley M. Ward.¹⁹_{Apr. 22} All the cases were relieved by the administration of vermicides.

The following "tonic vermifugal potion" is recommended¹⁸_{Oct. 1}:

Corsican moss,	5 grammes (gr. 77).
Ceylon canella,	2 " (3 ½).
Vinous syrup of quinquina,	25 " (3 6¼).
Boiling water,	150 " (3 4 and 3 6¼).

Pour the boiling water upon the Corsican moss and the ground canella, allow it to infuse until cold; express and add the syrup. Give the potion to young children in one or two doses, according to strength and condition of digestive functions.

G. E. J. Green,²²_{Sept. 28} contributes an account of the procedure in vogue among the peasantry of County Wexford, Ireland, for the expulsion of worms by means of *Prunella vulgaris*, or self-heal, known in Ireland as *Slán lus*, healing plant, and *Ceanabhanbeg* (pronounced cana-vawn-beg), signifying little fond dame. If upon rubbing a sprig of the plant briskly between the hands, while standing before the patient, no foam be produced, the palms of the hands and the soles of the patient's feet are anointed with the juice of the plant and a few drops administered internally, a cure usually results in twenty-four hours. This practice of the

Irish herbalists is presented as *à propos* of Dr. Foy's interesting paper ²²_{Sept. 12} on "The Doctrine of Signatures."

FILARIOSIS.

Lancereaux ¹⁰⁰_{Sept. 6} gives a most complete and lucid *résumé* of the anatomical lesions, symptoms, diagnosis, prognosis, and etiology of filariosis, a term which he applies to the entire group of pathological conditions resulting from the infection of the human organism by the *Filaria sanguinis hominis*, including lymph-scrotum, chyluria, and chylous dropsy of the peritoneum and tunica vaginalis testis. It is a malady of the tropics, the mosquito acting as the intermediate host of the parasite. One report of Dr. Lancereaux's paper ¹⁰_{No. 38} includes a useful bibliography not given in other reports.

Three symptoms seem to characterize the malady—soft tumification of the inguinal glands, hæmatochyluria, and the presence of *Filaria* in the blood.

Lancereaux recommends boiling and filtering the drinking-water as a prophylactic measure in all countries in which *Filaria* has been found, indicating his belief that it enters the human system by way of the alimentary canal. He has found inunctions of mercurial ointment in the region of the inguinal ganglia to be of service in the treatment of the disease, in connection with hydrotherapy, and suggests that injection of certain parasitocides into the lymphatic ganglia might be tried with the purpose of destroying the adult females which frequent these tissues. The prognosis is favorable, although the disease may last some time, but the evidence presented by Dr. Lancereaux coincides with that from other sources to show that removal from the source of infection results in a spontaneous cure.

The proposition of Patrick Manson, who has done so much to elucidate the etiology of filariosis, that all the lesions accompanying elephantiasis of tropical regions are attributable to *Filaria sanguinis hominis*, meets with opposition from Dr. Rake, ⁶_{Aug. 25} who states that he has failed to find *Filaria* in cases of elephantiasis and chyluria examined by him in Trinidad, and also by Dr. Sibthorpe, who had failed to find embryos in the blood of those suffering from hard elephantiasis.

A paper by Dr. Wm. M. Mastin, of Mobile, Ala., read at the Association of Genito-urinary Surgeons, on the history of

Filaria sanguinis hominis, its discovery in the United States, and especially the relationship of the parasite to chylocele of the tunica vaginalis testis, is a valuable source of information⁵⁰ for those who may desire to study the subject. In this connection reference may be made to the bibliography given by M. Marius Lacombe, of Lyons,¹⁴ and by Lancereaux,¹⁰⁶³ regarding the knowledge possessed by the ancients concerning *Filaria sanguinis hominis*, Dr. Lancereaux maintaining that the ancients knew nothing of the embryos described by Demarquay in chylous hydrocele, by Wucherer in urine, and by Lewis in human blood. He attributes to Demarquay⁵⁵ the discovery of *Filaria sanguinis hominis* three years before Wucherer,⁶⁴² to whom³ the honor is generally ascribed.

The life-history of *Filaria sanguinis hominis* has now been so thoroughly worked out by Lewis, Manson, Bancroft, Meyers, Mackenzie, and others that the only point remaining to be elucidated is the manner in which the parasite enters the human body, one theory² being that it enters through the skin of bathers.

DRACUNCULUS.

Alex. Sarcani¹¹⁸ reports two cases of Medina worm (*Filaria romanorum orientales*). The patients, mother and son, each presented suppurating swellings of the left parotid gland. Upon examination of the blood, very active, "snake-like worms were found moving in wild haste among the blood-corpuscles." He refers to the hypothesis offered by Davaine and Kuchenmeister that the "*Hanchoschim-Haschrofim*" afflicting the Israelite forefathers in the neighborhood of Horr and Aboth, on the shores of the Red Sea, was nothing more nor less than *Filaria sanguinis hominis*, which they swallowed in their drinking-water.

Madhva Rao Vinze,²⁰⁹ hospital assistant, gives an account of the successful employment of an Indian plant called by the natives of Dhar *Amarpattee*, by those of Dekkan *Pádpándá*, in the treatment of *Dracunculus* (*Filaria Medinensis*), which is a frequent parasite in Dhar. The old Indian proverb, "*Eká Narú, hájár Dárú*," which means, "There are a thousand medicines for one Dracunculus," has now lost its force, inasmuch as the *Amarpattee* proves to be almost a specific, having, in the hands of Dr. Madhva Rao Vinze, proved successful in twenty-five successive cases.

A dozen leaves of the fresh plant are bruised in a mortar and a little *chunan* mixed into it. The mass is then applied, covered over with some entire leaves, bandaged, and the diseased part kept at rest. Cessation of pain is secured in from two to ten hours, and after three or four applications the patient is cured. The people of Dhar, having a scant water supply, wash their clothes and clean their pots in the large public tanks, or *Báwareés*, and use the same water for drinking and bathing, whereby they become affected with the parasite.

N. Woskresensky reports a case of *Dracunculus* (called *Rischta*) in a Russian officer, who drank the water from the little ponds or lakes (*aryken*) in his journey to Buchara, and together with the water numerous small copepods (*e.g.*, Cyclops). After eight months phlegmonous spots appeared upon the feet, scrotum, hand, fingers, arm, and iliac region, which, upon being opened, were found to contain specimens of *Dracunculus*. The worms were seized by one end and twisted gradually about a small stick, until, with two days' continuous slow pulling, the Guinea worm was drawn out of the abscess, being from eight to thirty-eight inches long.

STRONGYLUS.

Magner, of Périgueux,^{188 Feb. 26} gives an interesting account of the occurrence of *Strongylus gigas* in a child two and a half years old. Persistent hæmaturia was followed by expulsion of portions of the parasite by the urethra at different times. Emaciation, insomnia, and continuous pain accompanied the development of a large abdominal tumor, from which abundant sanguineous liquid was removed by aspiration on several occasions. An operation was finally attempted, but not completed, owing to symptoms of collapse setting in, and upon subsequent death of the child an autopsy was refused. It is supposed that the tumor resulted from one or several large specimens of *Strongylus*.

A most interesting case of *Strongylus gigas* is placed on record by M. R. George, of Iowa,^{19 Aug. 25} and ^{199 Mar.} by Wm. F. Chambers. The worms, seven in number, were passed by the urethra, by a patient seventy-three years of age, the smallest worm being about three inches in length and two lines in diameter. Patient had suffered from severe attacks of pain resembling renal colic, followed by dull aching in the region of the right kidney. His urine

was found to be highly albuminous. General dropsy, setting in, was followed by death in a few weeks. An autopsy showed the right kidney enlarged (two and one-half pounds), resembling fatty kidney externally. About one-fourth of the entire mass, including the pelvis and infundibula, presented the appearance of having been eaten by worms. It looked like a broken-down hydatid cyst or a crumbly or cheesy mass of dry curds; the glomeruli, tubules, etc., were almost entirely obliterated, while the rest of the organ was more compact or fatty, held in place, apparently, by cicatricial tissue, but no more worms were found in the kidney, ureter, or bladder. The bladder and ureter were healthy; there were no abnormal adhesions, no communication between the alimentary and urinary tracts, and no evidence of peritonitis or typhlitis. George Dock¹⁹_{Sept. 16} suspects Drs. George and Chambers of having made a mistake, and doubts if any genuine case of the occurrence of this parasite in man has ever been recorded.

Dr. Joannès Chatin³_{Apr. 11}, ²_{Aug. 16} exhibited to the Academy of Medicine, Paris, at the April meeting, a specimen of *Strongylus paradoxus* sent to him by M. Taret, an apothecary of Oloron (*Basses Pyrénées*). His presumption is that the embryo *Strongylus* was taken into the human alimentary canal in drinking water, and not by direct transmission of the adult worm, inasmuch as the embryos are known to live for a long time in water. The adult parasite is commonly found in the bronchial tubes of swine, and it has been shown by Cobbold and Chatin that it is becoming more frequent among these animals, which suggests watchfulness on the part of sanitarians lest man should become more often the host of a worm which, from its peculiar habitat, is more dangerous than *Tenia*, *Oxyuris*, *Ascaris*, or *Dochmius*. The danger seems not to be imminent, however, as the case reported by Dr. Chatin is only the second to be recorded; the first, described by Diesing as *Strongylus longiraginatedus*, was found infesting the lungs of a child that died at Klausenberg, in Transylvania, in 1845. It has since been identified by Leuckart as *Strongylus paradoxus*. A very complete bibliography of the history of the parasite is given¹⁰_{Apr. 10}, ¹⁴⁰_{Nov. 16} with Dr. Chatin's remarks in full.

ANCHYLOSTOMIASIS.

Prof. Dr. Leichenstern (Köln), in a most interesting lecture before the medical section of the Naturalists' Convention, held in Cologne, September 21st, gives ¹⁸_{Sept. 18;} ⁵⁷_{Oct. 14} a painstaking review of our knowledge of *Dochmius* (*Anchylostomum*) *duodenalis*. He enumerates the various epidemics of the peculiar anæmia (anchylostomoliasis), produced by this worm sucking blood from the walls of the duodenum, that have occurred among brickmakers, miners, and men working in tunnels. Besides showing the identity of the affections known as Egyptian chlorosis, tropical chlorosis (*Hypocæmia intertropicalis*), brickmakers' anæmia, tunnel anæmia, or miners' cachexia (*Anæmia vel cachexia montana*), he points to the rapid spread of the disease over Europe through the employment of Italian and Polish laborers in building tunnels, and in mining and brickmaking. The uncleanly habits of these men, having their clothing continually bedaubed with mud (most Italian and many German brickmakers kneading the clay with their feet), eating without washing, and drinking water contaminated with the excrements of infected men, show how the disease is spread. The indications as to the necessity of employing men free from the parasites, of having frequently disinfected and convenient privies for all the workmen, and of furnishing them with pure drinking-water, deserve careful attention in America as well as in Germany, since American contractors are employing large gangs of Italians from districts in which anchylostomiasis is endemic in mining operations and engineering enterprises such as gave rise to its spread in Europe.

At the March meeting of the Ceylon branch of the British Gynæcological Society an interesting discussion ²_{Jan. 30} followed the reading of Dr. Gratien's paper, entitled "Notes on Some Cases of Anchyllostomiasis." The author testified to the success following the administration of thymol according to the method recommended by Dr. Lutz. Dr. Rockwood suggested that the association of anæmia with a certain amount of obesity might be looked upon as a means of differentiating ordinary anæmia and chlorosis from anæmia due to anchylostoma. He had been particularly struck with the amount of fat deposited in the skin, abdominal wall, and omentum in cases where quantities of the worms had been passed under the influence of thymol. He had also noticed

a greater liability to retinal hæmorrhage in cases of anchylostomiasis than in simple anæmia. The symptoms which characterized the anæmia of the St. Gothard miners, and which all the speakers at the International Medical Congress of 1881 held to be due solely to the presence of *Anchylostoma*, consisted of digestive troubles, abdominal pains, diarrhœa, and intestinal hæmorrhage.

Machado²¹²_{July} calls attention to the endemic of anchylostomiasis in the Commune of Porto-da-Cruz, near Funchal, Madeira, which is surprising from the absence of all the conditions generally associated with endemics of this disease. Porto-da-Cruz has a dry, volcanic soil, inclining rapidly toward the sea, no stagnant water, no rice swamps, no tunneling, no mining, the inhabitants living exclusively by agriculture. Dr. Machado confirms the statements of Griesinger and Ernst, as well as those of Rockwood, noted above, that profoundly anæmic patients affected with *Anchylostoma* retain a large amount of fat in the tissues.

The ethereal extract of male fern is found less efficacious than ten- to twelve-gramme (33) doses of thymol. Contrary to the general experience, Dr. Machado found the largest number of parasites in the first and second metres of the intestine.

J. Ernst⁶⁰_{Apr. 15} gives an extensive and detailed account of several cases of anchylostomiasis, in which he shows that persons may be afflicted with *Anchylostoma* for months before exhibiting any anæmic symptoms, and that the disease is spreading extensively among native brickmakers of Germany and Holland, being no longer confined to the Wallonsn and Vlamländers. Female specimens of *Dochmius* appear to exceed in number the males in the intestine. The male, on the other hand, exhibits the greater power of resistance to anthelmintics, the females being first expelled and finally the males. Dr. Ernst notes, also, the numerous cushions of fat in the panniculus adiposus, the tissues of the heart, in the mesentery, omentum, etc. He answers those who aver that the parasites are not active agents in the causation of the anæmic condition and that they do not withdraw from the host any great amount of blood by his description of the large amount of blood-corpuscles which each living worm throws out in clouds, when approaching death, from both the oval and anal extremities.

Brigade-surgeon Porter called the attention of the members present at the August meeting of the Central Museum of Madras

to a case in which *Dochmius* (*Anchylostomum*) *duodenale* was the cause of death in the case of a young Singalese domestic, sixteen years old, who was admitted to the Madras Hospital in a semi-unconscious state, apparently due to sheer exhaustion in consequence of a long-continued fever and diarrhœa. The autopsy discovered several specimens of *Dochmius duodenale* adherent to the congested mucous membrane. According to the statement of Dr. Porter, quoted in last year's ANNUAL, vol. i, p. 393, *Dochmius* is comparatively rare in Madras, one case ²⁰⁶ in one thousand autopsies.

TRICHINA AND TRICHINOSIS.

Adolph Lutz, of Sao Paulo, Brazil, in a series of three articles ⁴¹ _{Feb. 13, 14, 20} on the therapeutics of trichinosis, fixes the following stages in the disease: 1. From the ingestion of the encysted *Trichinæ* to the freeing of the same in the intestine of the host. 2. From the beginning of the development of the intestinal *Trichinæ* to the birth of the embryos. 3. From the time the young brood begins to wander to the disappearance of symptoms.

The first stage, depending upon the activity of the digestive processes and the compactness of the pieces of infected meat eaten, may vary from three to four hours or longer, and the therapeusis indicated is energetic evacuation, maintained for some time, even for several days. The stomach-pump and quick-acting emetics should be employed. As a purgative in this stage Merkel used with success compound infusion of senna. The indications for treatment in the second stage are as simple as those of the first—i.e., to kill the liberated worms and cause their evacuation before the fifth or sixth day. Pure glycerin has been employed in this stage with success. For the third stage the problem is much more difficult. No medication or physical means is known by which the young, wandering *Trichinæ* are driven out of the tissues. It should, however, be borne in mind that the invasion of the tissues by the young *Trichinæ* occurs at intervals, as different broods reach the proper age, the infected flesh having been eaten at successive meals, perhaps.

The treatment suitable to the second stage is proper here, with the object of limiting the number of worms entering the tissues. Diagnosis depends upon—(1) proof of the ingestion of living muscle—*Trichinæ*; (2) the detection of *Trichinæ* in the

developmental stage, or by characteristic fragments of the same in the dejections; (3) in seeking *Trichinæ* in small pieces of muscle taken from the patient by means of the harpoon or by incision, also by the blood and the fluids of the serous cavities. In diagnosing the case from the symptoms it is to be borne in mind that they set in from two to three days after the ingestion of the infected pork. They are confined at first to the alimentary tract (pain, vomiting, diarrhœa), but gradually become widespread (depression, headache, thirst, fever). The symptoms rarely take on a severe choleraic character before the birth of the young *Trichinæ*, which takes place on the sixth day after ingestion, rarely on the fifth day. One of the most noteworthy symptoms is the œdema of the eyelids, which first sets in on the seventh day, disappearing after a few days to appear later. Still later œdema of other parts of the body occurs. The muscles become stiff and hard and movements are restricted. Difficult deglutition, hoarseness, and weakened respiration result from the disabling of the muscles. Profuse transpiration and sleeplessness may intervene, or fever, quickened pulse, thirst, scanty, concentrated urine, delirium, decubitus, persistent diarrhœa (not constant), bronchitis, inflammation of the lungs. The mechanical action of the intestinal *Trichinæ* cannot be regarded as the cause of the symptoms, but it seems as if some pyrogenic substance comes in play, which is possibly the result of the life processes of the parasites themselves. After having formed, with more or less certainty, a diagnosis from symptoms, it remains to kill or expel the *Trichinæ* of the first or second generation, which are somewhere in the intestine. Two ways of accomplishing this result are open to us—mechanical removal by means of purgatives or the destruction of the parasites by means of anthelmintics, or a combination method, by which the parasites are first disabled and then passively removed.

Dr. Lutz then discusses the appearance of *Trichinæ* in the dejections and the circumstances under which they may be retained in the bowel, *e.g.*, by folds in the intestinal mucous membrane, masses of tenacious mucus. The difficulty of finding *Trichinæ* in dejections is increased by the presence of a bulk of fœcal matter. It is well, therefore, to give laxatives fasting, together with irrigation of the bowel. In the comparatively clear matter thus secured the *Trichinæ* can be more easily detected. Dr. Lutz employs the

following method : A large, thin, glass plate is used, made readily movable by having its edges supported by thin strips of glass. Upon this the mass to be examined is spread in a thin layer, being diluted, if necessary, with water. It is not always necessary to place a thin cover-glass over the material. By means of a strong light and a concave mirror, *e.g.*, a laryngeal reflector, a beam of intense light can be thrown obliquely upon or through the preparation and the *Trichinæ* made to appear as little, glistening silver hairs. Myopic or normal-sighted persons can make the examination best with the naked eye; hypermetropic and presbyopic observers can use a lens. The employment of the microscope is not recommended, since one looks over too small a field. If the *Trichinæ* have been found to be embedded in the mucus of the intestine, such materials are to be employed as will loosen them. Alkalies and salines have proven unsatisfactory. Calomel cannot be given for any length of time from danger of producing stomatitis, nor podophyllin from its tendency to gripe. Dr. Lutz recommends, therefore, *ext. rhei et pulvis fol. sennæ*. He, however, suggests experiments with large doses of sulphur, as well as with keratin-coated pills, by means of which hydrochloric acid and salicylic acid can be used as desquamating agents. These methods must be employed promptly, and, if their success seems problematic, anthelmintics employed. In answer to the question as to what may be the proper anthelmintic, Dr. Lutz divides the available materials into three groups:—

1. Strongly hygroscopic substances that act directly upon the integument of the worm. Glycerine, recommended by Fiedler,³²⁶ is referred to and experimentation suggested, as well as with alcohol. 2. The second group is made up of stupefying or narcotic agents, such as ether and chloroform. Alcohol must also be included in this group. 3. Special parasitocides. Many aromatic substances, ethereal oils, metals, and their salts are poisonous to lower organisms. Of those substances which have been experimented upon, thymol holds a front rank. Many other worms are known to be killed by this substance, and why *Trichinæ* alone should have a power of resisting its action is not easily seen. Dose, six grammes (3 1½) daily, in three doses. This may be continued for several days, but it would be well to examine the urine each day for albumen. Ethereal extract of male fern seems much like thymol

in its effect and can be used for several days. Oleum chaberti and kamala, both of which work so well with cestodes and other nematodes, may be tried. The activity of kamala, however, depends entirely upon the freshness, etc., of the drug. Simple vermifuges must not be relied upon.

Finsen¹²_{Apr.} reports a case of trichinosis in Copenhagen in which glycerine in large doses, as recommended by Merkel, was tried, but without effect, probably because it was begun too late, i.e., after the young *Trichinae* had passed out of the intestine into the tissues.

J. W. Kœhn,^{115 60}_{Jan.; Feb. 25} in a paper read before the Chicago Pathological Society at the meeting in January, calls attention to a specimen of encysted *Trichina* taken from the muscles of a cat which had been injected with carmine gelatine by Dr. L. B. Oliver, of Dublin, Iowa, for the purpose of demonstrating the vascular system of the intestinal villi. Dr. Kœhn refers to the fact that the presence of a dense net-work of vessels about the capsules of *Trichina* has been noted already, but that the specimen in question differed from any hitherto observed in "that the vessels not only surround but enter directly into the capsule." This, he says, seems to prove that the worm is nourished and supplied with arterial blood directly through the capillary system, and looks to his discovery to explain the pathological conditions peculiar to trichinosis, such as "swelling of the solitary and mesenteric glands, ecchymoses of the mucous membrane of the intestine, fatty degeneration of the liver, changes in the cortical substance of the kidney and the muscular tissue of the heart, bronchial catarrh," etc., and hopes from it important changes in the matters of prophylaxis and treatment. Dr. Kœhn seems to be scarcely justified in his expectations, as it has long been known that the capsules of parasites, encysted in parenchymatous organs, are *traversed* by blood-vessels, forming sometimes a definite system of afferent and efferent vessels, by means of which¹⁰⁶⁴_{p. 20} the parasite is supplied with nutriment, being absorbed by it through its mouth or skin, and which varies in quality according to the structure of the capsule. The capsule results, in the first place, from the hypertrophy of the connective tissue due to the congestion set up by the irritating presence of the parasite. During this stage of abundant nourishment the worm is active and the resulting symptoms in the patient acute, but abundant ingestion

means abundant excretion, and we soon have the worm cutting itself off from its food supply by the accumulated excretory product which forms, in the case of *Trichina*, a calcareous capsule within the connective-tissue capsule. Being thus deprived of its former abundant supply of pabulum and oxygen, the worm becomes quiescent (remaining so until released by disintegration of its host and its capsule), and irritation ceases together with the consequent congestion, and in due time the vessels of the connective-tissue capsules atrophy. It is, therefore, probable that the capsule exhibited by Dr. Kœhn was of recent origin, and that had he prepared it later the vascular supply would have been less anomalous.

Dr. Osten, of Hanover,⁴¹_{Dec. 16, '87}¹⁰⁷_{Mar.} presents an interesting report by which the period of incubation of *Trichina spiralis* in the intestine is well demonstrated. Between the 18th and 25th of October seven women ate a poorly smoked sausage. October 31st it was discovered that the meat had been taken from trichinous swine, owing to the fact that the pork had been brought from the town of Wildemann, where over a hundred of the inhabitants had been taken down with severe symptoms of trichinosis. Examination of remnants of the sausage showed living *Trichinæ* in great numbers. It occurred to Dr. Osten that as these women were still in good health the parasites had not yet bored through the intestinal wall and might be removed by the use of laxatives. The only symptoms of the presence of *Trichinæ* was the aggravated diarrhœa of an old woman who was suffering from a chronic form of that disease. Beginning on October 31st, the patients were given for fourteen days castor-oil in the morning, or, when this brought out idiosyncrasies, Epsom salts instead. After thus inducing abundant and watery defecations, dessertspoonful doses of pure glycerine were given for the same time, and at the date of the report, four weeks after the patients had eaten *Trichinæ*, they were free from any bad symptoms. Experiments under the microscope showed that glycerine quickly killed living *Trichinæ*.

Johne's recent book¹⁰⁶⁵ is spoken of⁴¹_{Oct. 18} as ranking highest among all books of like nature. A general survey of anatomy and histology is followed by a chapter on the theory and use of the microscope, and finally a careful exposition of the life-history of *Trichina* is given.

An account^{123 Feb. 1} is given of twenty cases of trichinosis in Ober-Sachsenfeld, in Cunewald nineteen, and in Ober-Cunewald one hundred and fifty-three cases, to which is added a *résumé* of the recorded cases in trichinosis in Saxony from the time *Trichina* was discovered in man up to the present, and a summing up of the twenty-three hundred cases with thirty-five deaths. This is followed^{123 Feb. 16} by an enumeration of the various commissions that have been appointed for the inspection of meats since 1860, and the symptoms exhibited by the patients in the Cunewald epidemic of 1888. The debate in the Landtage on the petition for the establishment of an obligatory inspection of pork throughout Germany is also given. The article is replete with statistics relating to trichinosis. The order^{123 Aug. 1} of the Minister of the Interior of Germany, issued July 21, regarding the method in which the obligatory examination of pork shall be carried on for the prevention of trichinosis, contains fourteen sections concerning the regulations of record books, character of microscopes to be used, appointment and pay of examiners, *i.e.*, for each hog, one mark; for each examination of pork, ham or sausage, fifty pfennige. The examination of each hog must include six pieces of flesh, as follows—(a) from the columns of the diaphragm, (b) from the muscles of the diaphragm, (c) from the intercostal muscles, (d) from the abdominal muscles, (e) from the lumbar or laryngeal muscles, (f) from the tongue muscles. From each of these six pieces of flesh at least six preparations must be made, in the form of longitudinal sections one centimetre long by 0.5 centimetres broad, and thin enough for investigation. In the examination of ham and sausages three pieces of flesh are to be taken from different parts, and from each at least four preparations made. The tests of pork and meat should be made in the region of bones and tendons. Each *Trichina* examiner is limited to the examination of ten hogs in one day. The ordinance took effect September 1st.

BARBED-HEADED WORMS—ACANTHOCEPHALI.

Prof. B. Grassi and I. Calandruccio^{50 M.S. No. 17} have added a new form to the long list of animal parasites infesting human beings. They give a description and figures of *Echinorhyncus moniliformis* (Bremser), with which Professor Calandruccio was himself afflicted,

having dislodged over fifty specimens from his intestine by means of ethereal extract of male fern.

Echinorhyncus occurs but seldom among mammals with the exception of *Echinorhyncus gigus*, which is rather frequent in hogs (40 per cent. in Catania). The above-named helminthologists have added to this a species in the small intestine of the dog, probably a new species; and another in the intestine of *Mus decumanus* (1 to 2 per cent.) and in *Myoxus quercinus*.

This last parasite, *Echinorhyncus moniliformis*, was also found to have a very common beetle (*Blaps mucronata*, Lat.) as its intermediate host. Several hundred young of *Echinorhyncus moniliformis* were found in a single *Blaps*; they were encysted and visible to the naked eye. Upon being given to white rats, previously ascertained to be free from parasites, they developed in the course of a year into adult specimens of *Echinorhyncus* about one centimetre in length.

Although the case of Professor Calandruccio is the first on record in which *Echinorhyncus* has been observed as a human parasite, its discoverers believe it to be common enough, from the habit which prevails to some extent among the peasantry of Catania and Egypt of eating its intermediate host, *Blaps*.

FLY PARASITES.

Sven Lampa,^{682 50}_{p.5, 77; V.4, No.12} after criticising the common habit of omitting to rear and determine the species of fly larvæ found in the human intestine, describes a case where numerous larvæ passed in the dejections, proved to belong to the flies *Aricia* (*Homalomyia*) *scalrais*, Fab.; *Aricia manicata*, Meig; and *Aricia incisurata*, Zett.

Prof. Dr. Rembold exhibited at the February meeting of the Verein der Aerzte in Steiermark⁸⁴_{Mar.10} some larvæ of *Anthomyia* which he had found in the dejection of one patient, and in the urine of another patient suffering from hemiplegia and having a wound in the neighborhood of the genitals.

An instance is recorded²⁸_{July} of the fly *Lucilia nobilis* depositing its eggs in the human ear, producing suppurative discharges by the external meatus and Eustachian tube, and, upon syringing, a large number of maggots, which were reared to the adult insects.

Jabez Hogg²²_{May 30} refers to the reported cases²²_{May 16} in which maggots

in carious teeth are expelled by the inhalation of fumes of henbane seeds or of tobacco or by other means. He calls attention to the fact that these supposed larval entozoa usually prove to be shreds of tissue or lymph detached from inflamed gums, or spiral fibres from some vegetable, as, for instance, celery, capillary segments of the orange, etc., and that physicians should keep this fact in mind when told that worms have been seen to drop out of the mouth of the patient after the inhalation of the fumes of certain drugs.

DISEASES OF THE KIDNEYS, BLADDER, AND SUPRARENAL CAPSULES.

By JAMES TYSON, M.D.,

AND

ALLEN J. SMITH, M.D.,

PHILADELPHIA.

BRIGHT'S DISEASE.

Etiology.—Gaucher,³ in a paper on the “Pathogeny of Bright’s Disease” before the Société Médicale des Hôpitaux, says the excessive introduction into the organism or the *exaggerated production in it of extractive matters* is the ordinary pathogenic condition of the large white kidney. The exaggerated introduction by the ingestions of meats, beef extracts, etc., or the excessive production of extractive matters, suffices of itself to produce the epithelial form of Bright’s disease; but if chronic nephritis produced by any cause had existed, the defective elimination of extractive matters will aggravate the renal lesion.

The possibility of *malaria* being the cause of Bright’s disease has received considerable support from a paper read by Charles S. Wood⁵⁰ before the Northwestern Medical and Surgical Society, of New York. He based this on his own experience and that of other home and foreign authorities, among whom he mentioned Blackhall, Chénoriard, Nieret, Long, Rosenstein, Soldaton, MacLean, Park, Dickinson, Busey, Da Costa, Loring, Pepper, Clemens. He might have added the authority of all who have had any experience with this subject or given any thought to it.

Paul Snyers, of Liège,⁵² Nov. 28, 97 submits the following conclusions, deduced from his experiments upon albuminuria and renal lesions following upon the injections of albumen: 1. The albuminous dyscrasia determined by the injection of the white of egg is transitory and ceases twenty-four hours after the injection. The albumen found in the urine is only white of egg albumen injected. It is a useless substance, which traverses the organism and is eliminated naturally by the kidney without producing lesion.

2. The histological examination of the kidney shows no lesions, even if the injections have lasted thirty days. 3. The fact that the injection of the white of egg produces only transitory albuminuria shows that it is not only incapable of producing the lesions of nephritis, but even pathological albuminuria. These conclusions are contrary to those arrived at by the eminent Italian physician, Semmola, who claims to have found a chemical and molecular alteration in the blood, which becomes the cause of the diverse lesions of the kidney. A committee of the Academy of Medicine of Brussels appointed to examine the paper of Snyers reported as follows: 1. There is an antagonism between the results of Semmola and Snyers, and this fact alone requires new and more numerous experiments. 2. It seems that the nature of the albumen employed in these injections would be of importance in judging of the results obtained, and ought perhaps to explain the albuminuria so frequent in infectious and certain nervous diseases. 3. In certain details of the experiment of Snyers there seems to have been some trace of lesions or alterations in the circulatory apparatus.

Oppenheim⁴_{Dec. 28, '97} adds to four cases of *acute nephritis after varicella* published by Henoch in 1884 and a contribution by Jansen on this subject, such a case under his own care, with the object of showing that this axiom is not so rare as might appear, and that varicella, therefore, is not necessarily so harmless an affection as is commonly supposed. His patient was a five-year-old, well-nourished child, which after some days of loss of appetite, broke out with a copious varicella eruption on the twenty-first of September, chiefly in the head and both arms, later upon the legs, and to a less degree upon the rest of the body. The temperature was 38° C. (100 $\frac{4}{10}$ ° F.), but the child was not otherwise ill and he was simply put to bed. On the eighth day at the doctor's visit the mother showed him a dark-brown urine thick with sediment. It contained a large amount of albumen, a few blood-corpuscles, casts and epithelium, and had a specific gravity of 1040. Edema was never present. He prescribed simple diet of milk, rest in bed, sweating baths, and internally tannic acid and bicarbonate of sodium. Eight days later the urine was clear, free from albumen, copious instead of scanty, while the night urine was still scanty, of dark color, and albuminous. Eight days later the urine was entirely free from abnormal constituents and the patient recovered.

Mycotic Origin of Acute Nephritis.—Julius Mannaberg,^{319 22}
working in the clinic of Professor Nothnagel, has discovered a streptococcus in the urine in eleven cases of acute Bright's disease. The micro-organism presented the same appearance as the streptococcus pyogenes of erysipelas, and the number was in direct proportion to the severity of the disease. The cocci were stained in the usual manner, after the method of Gram, and when thus colored retained their stain. After being isolated on the agar plate, the micro-organism under consideration could be cultivated in gelatine, agar, blood-serum, and potatoes. On gelatine the culture formed a white stripe and was composed of small granules. After three or four weeks the culture assumed the shape of a funnel, and at the same time excrescences formed on the various parts of the stripe, radiating in the form of a fasciculus into the gelatine mass. This appearance distinguished the culture from all bacteria hitherto studied. This culture on the potato could be distinguished from that of other streptococci, as the streptococcus pyogenes and streptococcus erysipelatus. In two hundred examinations of urine from forty-five individuals who did not have Bright's disease no similar cases could be discovered. Subcutaneous implantations of the fungus gave rise to abscess and intravenous injections to severe symptoms. In three or four days after injection blood-cylinders, albumen, and similar streptococci appeared in the urine, and these symptoms lasted from three to fourteen days, while the identity of the fungus was shown by recultivations. The kidneys of the infected animals presented hæmorrhage and a gray lead color of the cortex. In one case the renal tissues showed a yellow tumefaction and flaccidity two months after the injection. The post-mortem examination of a rabbit revealed also endocarditis, and the same streptococcus could be cultivated in the endocardial layer. There were also infarctions of the kidneys. In three cases the streptococcus could be cultivated from these kidneys. Dr. Mannaberg concludes as follows: In the majority of cases of acute Bright's disease the streptococcus was found in large quantities in the fresh urine, which was not the case in the urine of healthy persons, although affected with another malady. The pure culture of this microbe differed essentially from all other micro-organisms hitherto described. The injection of this streptococcus into the blood-vessels of rabbits and dogs produced an inflammatory lesion

of the kidneys, whereas the other organs were only exceptionally affected; whence he believes that he has proven with a certain degree of plausibility that certain forms, and perhaps all forms, of the idiopathic acute Bright's disease have a bacteriological origin.

Stephen Mircoli,²⁶
Dec. 15, '97 reports the results of an examination of sections of the kidney in a boy aged three who was one of three victims of an epidemic in a town in Italy of three thousand inhabitants, in which occurred seventeen cases of primary nephritis in children of three to ten years old. The illness began with high fever, lasting three or four days, giving place to œdematous collections of a peculiar hard character. Death or convalescence ensued within a fortnight. Sections of the kidney in the boy referred to, who died on the fifth day of his illness, showed, when treated by Gram's method and after staining with carmine, numerous violet spots in the cortical periphery, glomeruli, toward the middle of the pericanalicular spaces, and lastly in the tubules. Highly magnified, these spots showed roundish, longish ovals, some being even rod-shaped, surrounded by a whitish capsule, and always in pairs. Sometimes they were in series or chains of four or six together, more often grouped to form the violet spots. The thrombi, which nearly filled up or dilated the vessels of the cortex and pyramids, were made up of these spots. No hypothesis is ventured as to these elements, but Mircoli considers them very likely pneumococci, as Krebs has delineated them in his "Pathological Anatomy" and as he found them in a patient who died of pneumonia. No micro-organisms were found in the kidneys of the other children, who died on the sixth and tenth days of their illness respectively, but only signs of general inflammation.

Sections of the same kidney, treated with logwood and carmine, showed epithelium of the tubules in a state of cloudy swelling. The cell nuclei were almost entirely lost to view and only their peripheries were visible, but the cells contained numerous well-stained small bodies which gave the impression of micro-organisms. The chromatin had escaped from the nuclei and resembled Fleming's colored granules in the cell, as Madame Dr. Cattani has observed in the pleura in rabbits after artificial pneumonia, but the process has not yet been seen in the kidney. The inflammation was not glomerular or glomerulo-capsular, but rather a general

mycotic inflammation of the whole kidney. Primary nephritis is always rare in children, and, according to Mircoli, has not yet been described as an epidemic. At the time of this epidemic of nephritis in children none of the zymotic diseases which most frequently cause nephritis of the kidney were prevailing in the same district.

In a paper upon "Primary Bacteridic Nephritis" by S. Perret,²¹¹ he first quotes a case published by Babès as far back as 1885,¹¹⁴⁴ in which the tubules and vessels of the kidney were filled with bacteria. He then relates a case of nephritis under his own observation in which the diagnosis of mycotic origin seems to have been based on the presence of bacteria in the urine, as the patient left the hospital improved.

Morbid Anatomy.—An important event of the year in the morbid anatomy of renal diseases is the appearance of a fasciculus of Francis Delafield's studies on pathological anatomy, containing the histological appearances of acute forms of Bright's disease, alongside of illustrations of the normal histology of the kidney. These plates are marvels of execution, and are either drawn by Dr. Delafield himself, or are photogravures of the actual specimens, and may, therefore, be regarded as strictly accurate. While the drawings have about them the suggestion of being somewhat more finished than are the appearances of the actual specimens, this feature is not more so than is commonly the case with drawings. They are a lasting memorial of their author, and it is to be regretted that the necessary cost of the atlas must prevent its widespread circulation.

Delafield modifies somewhat the prevailing classification of acute Bright's disease. In it he includes (I) acute exudative nephritis, (II) acute degeneration of the kidney, and (III) acute diffuse nephritis. I. The first term he applies to acute inflammation of the kidney characterized by congestion and the exudation of plasma and the migration of white blood-cells, with swelling or necrosis of the renal epithelium and changes in the glomeruli. Of exudative nephritis, again, he makes three varieties: (1) a mild form, which may give symptoms during life, but leave no lesion of the kidney after death; (2) a more severe form, in which we find inflammatory changes in the kidney after death, exudations of red and white corpuscles and coagulable material in the tubes,

glomerules, and stroma ; (3) a form characterized by excessive production of pus-cells. This form is caused by exposure to cold, without appreciable cause, and by scarlatina.

II. The term "acute degeneration of the kidney" he applies to an acute change in the organ characterized by degeneration or death of the epithelial cells. The change is usually characterized as cloudy swelling, is generally secondary to early disease, and is usually of so mild a type that it can hardly be said to have symptoms of its own, although the severer forms are dangerous to life, even though disturbances of the circulation are not associated with them.

III. Acute diffuse nephritis, the most serious and important of all the forms of acute Bright's disease, not only for the reason that it involves so many structures of the kidney, but because its lesions are from the first of a permanent character, and because disturbances in the circulation are so frequently associated with it. It is one of the forms of scarlatinal nephritis, and occurs early and late in the course of diphtheria ; it is the most important variety of nephritis in pregnancy and is especially frequent as a primary affection, with or without the history of exposure to cold. In these kidneys we find the same lesions as in exudative nephritis, but with two additional occurring early : (1) the growth of connective tissue in the stroma ; (2) the growth of the capsule-cells of the Malpighian bodies. These changes involve only symmetrical strips or wedges in the cortex, which follow the line of the arteries. In these wedges the constant change is a growth of new tissue in the stroma between the tubes. The walls of the arteries which run up through each wedge into the cortex and send off branches to the glomeruli are thickened. The glomerules themselves become the seat of changes of a permanent character, the same growth of the cells covering the vessels and of the cells within them, as in exudative nephritis, reaching even a greater development. The tuft never returns to its natural condition, and in time its vessels are obliterated. These views of Dr. Delafield appear well founded from an anatomical stand-point, but I am inclined to believe that it is often difficult to distinguish clinically between the exudative and acute diffuse nephritis.

Relation of Different Forms of Parenchymatous Nephritis.—
The transition of the kidney of acute parenchymatous nephritis

into large white kidney and thence into the fatty and contracted kidney is shown by a case of nephritis of twenty years' duration following scarlatina. It is reported by Aufrecht.^{326 32}
Id. 42; Sept. The patient had scarlatina when nine years old, and six months later had anasarca and albuminuria, which eventually passed off, but for no less than twenty years from this time he had, with but few intermissions, albuminuria. Whenever he had a chill the urine was not only albuminous, but also had blood and casts. For five years he suffered from headache similar to migraine, which came on after dinner, but which was controlled by regulating his diet. The nephritis appeared to have been quiescent during boyhood, for it had no baneful influence on his development or school career. He took part in various bodily exercises and passed the usual examinations without difficulty, but during the last two years of his life he showed symptoms of a decided uræmic nature, viz.: headache and vomiting. The patient died on the 9th of July, 1887, the uræmic symptoms being present during the interval, to which was added left-sided hypertrophy in May. He became rapidly emaciated during the last month of his illness. At the necropsy considerable hypertrophy of the left ventricle was found, the kidneys were atrophied and contracted and coarsely granular, of a white color, but variegated by some degree of hyperæmia. Such authenticated examples of the transition from nephritis to small, white kidney are rare.

Symptomatology.—In a paper on "Epistaxis in Interstitial Nephritis" before the Société Médicale des Hôpitaux, Gaucher⁶¹
July 22 said that these cases are very obscure and it is often difficult to arrest the hæmorrhage, and in all instances of true epistaxis interstitial nephritis may well be suspected. In a case of this kind he prescribed an absolute milk diet and a mixture of the extracts of cinchona and rhatany, and from that moment the hæmorrhage diminished progressively. A similar case was reported from Huchard's practice.

Nervous and Mental Affections.—William Osler¹⁴⁴ reports three cases of mental derangement due to Bright's disease, the one a man of forty-two, who, when brought to the hospital, had been maniacal for three or four days, and who subsequently became comatose and died. The second was brought to the hospital of the University of Pennsylvania on a Thursday evening. Osler

saw him on Saturday. He was then quiet, in a semi-dozing condition, but could be roused, and gave a very interesting account of himself. The whole clinical picture was that of chronic interstitial nephritis. There was nothing to attract special attention to his mental condition and he did not regard his state as critical. That night he got out of bed, wandered about the ward, and finally jumped out of the window. Another interesting case occurred in the care of Dr. Mullen, of Hamilton, Canada, where the medico-legal question arose as to whether the man was fit to make a will. There was no doubt as to the existence of chronic Bright's disease, and he believed that his wife and others had designs upon his life, and that people were persecuting him. It was not thought advisable that he should make his will. Under more active treatment he did well, his mind cleared, and recovered sufficiently to get about to make his will. I have myself under my care at this time a widow forty-eight years old, with chronic interstitial nephritis and concurrent or secondary cardiac hypertrophy. While her husband lived she had the impression that he sought her life. With his death, of course, this impression disappeared, and it seems not to have been substituted by anything of the same kind.

In a paper read before the Neurological Association in September, Robert T. Edes²⁴²_{Sept.} mentions the following nervous symptoms as following acute and chronic diffuse nephritis in their various forms often enough to be legitimately recognized as having an intimate relationship with them, namely: convulsions, coma, delirium sometimes becoming insanity, headache, dyspnoea, failure of vision and hearing, paralyses, neuralgia, itching, sometimes cutaneous eruption, dead fingers, rarely symmetrical gangrene. Dr. Edes suggests that in addition to the usual excrementitious substances held responsible for uræmia we may add, with considerable probability in its favor, but as yet little evidence, ptomaines. The diagnosis between Bright's disease and headache on the one hand, and cerebral disease with polyuria on the other, is not always easy. Albumen and casts may be present in either. Localization of the headache or of any paralytic or spastic symptoms, a study of the eye-ground and the heart, and more than a single urinary examination may for a considerable time be all that can be depended upon to make the distinction.

While recognizing the presence and importance of the uro-toxic origin of headache, Dr. Edes cannot regard this to be the usual one, considering the absence or rarity of headache in complete suppression of the urine, and also considering its coming and going in ordinary cases in a way and under therapeutic influences more consistent with a neurosis. If it be said that the relief afforded to the headaches of renal disease by the hot-air baths is due to the elimination of peculiar urinary products, it may be answered that the bath relaxes the arterioles as well, and the relief is often of too long duration to be explained simply by the removal of a certain excess of poison, which must constantly be in process of renewal. Insanity and delirium are not early, distinctive, or common uro-toxic symptoms. At the termination of chronic Bright's disease delirium is more common and more marked, but here we are dealing, not only with retained secretion, but with anæmia, malnutrition, cardiac weakness, and other conditions which produce delirium.

In the discussion of Edes' paper, Seguin said that a characteristic headache of the pre-albuminuric stage of Bright's disease was the occipital form, extending often into the cervical region; occasionally there was increased action of the heart, and usually hyaline casts were found in the urine, but albumen rarely at this stage.

Complications.—J. M. Da Costa, ⁹_{May}, in his Middleton Goldsmith lecture before the New York Pathological Society, concludes that valvular disease of the heart rarely leads to disease of the kidney other than chronic congestion, which in its turn may pass into chronic parenchymatous nephritis. The granular contracted kidney, he considers, does not result from the chronic congestion alluded to. My own experience confirms these conclusions as to the passive congestion or cyanotic induration being the sole result. Sometimes this terminates in a slight degree of interstitial hyperplasia, but chronic parenchymatous inflammation is still more rare. In this connection should, perhaps, be mentioned the conclusions of Delafield, as quoted by Da Costa, decidedly at variance with those of the latter and myself. Delafield reports that in one hundred and thirty-seven cases of death from heart-disease there were twenty-seven large white kidneys, twenty-nine atrophied kidneys, and twenty-eight of chronic nephritis which could not be classed either as large white or atrophied organs. Could some of these

conditions have been coincidences rather than results? For, as Da Costa further says, the valvular disease of the heart which occurs in diseases of the kidney may be of varying origin, chronic thickening, degenerative changes, co-existing rheumatic alterations which have led to these changes, and, lastly, mere hypertrophy and dilatation, which, associated perhaps with slight valve thickening or rigid papillary muscles, in its turn leads to valvular imperfection. Omitting the last-named group, the ordinary valvular affections in the Bright's diseases are the result of the altered tissue nutrition of the valves and the degenerative changes which take place there, as they take place in both the large and small vessels of the body. They are favored to a greater or less degree by the morbid products which, from want of proper elimination by the kidneys, circulate in the blood. He says, too, it may be a question whether, in part at least, the altered nutrition of the valves may not be due to alteration in their nerve supply.

Da Costa also says that we may assume as positive that hypertrophy of the heart does not occur in acute Bright's disease. This is vastly different in the chronic form of the malady, where, as is well known, hypertrophy is the rule. He insists, moreover, that the cardiac hypertrophy which is found in Bright's disease, or more particularly the contracted kidney, is not in any sense the consequence of that disease, but an integral part of the same morbid process of which the kidney lesion is almost the only obvious expression; that chronic Bright's disease ought not to be looked upon as an affection of the kidney, although it is there that to the naked eye the most prominent lesions occur.

In adopting this conclusion, the cases that die of apoplexy from disease of the vessels of the brain before the kidney disease shows any sign, the cases with general vascular tension in which there is as yet no albumen or other sign of renal malady, the cases with marked, the cases without as marked, cardiac lesion, receive their ready explanation. They cease to be objects of wonder. The mischief wrought by the general malady has been wrought more elsewhere than in the kidneys. It may exist to a greater or less degree in any structure. These conclusions he draws more particularly from a study of the contracted kidney, to which he adds that it would be better to limit them and to call this general malady Bright's disease of the kidney only until some one with a

genius for names gives it one we can all adopt. There may, in fact, be some other forms in so-called Bright's disease which are really affections of the kidney.

In his most recent work, George Johnson¹¹⁴⁵₁₈₉₇ summarizes his views in five propositions, which amount to this, that chronic Bright's disease is a constitutional malady, characterized by a morbid state of the blood, which leads first to changes in the secreting cells of the kidney, and, secondly, to alterations in the blood-vessels of the kidney and other organs.

Semmola, of Naples,⁶⁹_{v.14, Nov. 31-22} also says that the malady is not essentially renal, but considers it a general morbid alteration of nutrition. The albumen, in such cases, is not passed by the urine only, but by all the secretive organs. The renal alterations are the results of the mechanical alterations of the kidneys by the constant passage of the albumen through them.

The main purpose, also, of the recent work of the late J. Milner Fothergill¹¹⁴⁶₁₈₉₇ is to establish the proposition that Bright's disease is primarily a blood disease, induced by impaired digestion, or, at any rate, by retention within the blood of effete products, namely, uric acid, which should be eliminated from it.

Da Costa reiterates, in his Middleton Goldsmith lecture, the view some time since announced in a paper, by Morris Longstreth and himself, that the original starting point of the changes and alterations alike in the vessels and heart muscle lies "in the nervous ganglia and in the parts of the nervous system controlling the nutrition of these textures."

Recently Arthur V. Meigs⁵⁹_{July 7} has made some very careful examinations of the arteries and veins in Bright's disease, and has found a positive and unmistakable change in the intima; but while he has found arteries of which "it could be said that the middle coat was unduly thick, and again others in regard to the state of which there might be dispute," in most instances he has "failed to find an increase so that its existence could be considered to be beyond doubt." The alteration found by Dr. Meigs in the intima was irregular rather than uniform, contrasting strongly in this respect with the uniform thickening of the intima described by Johnson. The condition is a cellular hyperplasia, and corresponds in the various forms and stages with the atheromatous change as described in text-books; in a word, chronic endarteritis. His

studies were made upon sections of the brain, spinal cord, lungs, heart, liver, spleen, and kidneys, and in various of the larger arteries and veins, and in all of them except the spinal cord, as to which he does not regard his studies having been sufficiently numerous or conclusive, he found quite constantly this irregular outgrowth and thickening of the intima, in some instances almost to the degree of obliteration. Dr. Meigs also found similar but less-marked changes in the veins. He agrees with Da Costa in regarding the vascular and cardiac changes due to a common cause.

In regard to these changes, ¹¹² I have found with great uniformity the thickening alluded to residing in both the intima and media. That of the intima is generally irregular and uneven and cellular, corresponding in all respects with Dr. Meigs' drawings, but that in the media seems to be a true overgrowth of muscular fibre-cells rather than inflammatory infiltration. As constant as the vascular changes in renal cirrhosis is hypertrophy of the left ventricle, which in my experience is at first pure and uncomplicated. As the disease progresses there is often slight thickening of the valve-flaps, and the auriculo-ventricular orifices may become insufficient from the dilatation, which is gradually added to the hypertrophy. More extensive valvular changes are not common, nor is there degeneration of the heart muscle until the disease becomes advanced, when it is probably brought about by interference with the circulation in the coronary arteries due to the thickening of the intima described.

While I am disposed to agree with the authors named, that renal cirrhosis is a part of a general condition involving the vascular system throughout the body, including the kidney, and to regard the changes in the intima as essentially inflammatory and the result of the irritation of a morbid substance circulating in the blood, I am unable to agree with Da Costa and Meigs in the belief that the same explanation holds good of the hypertrophy of the heart and the muscular coat. That the changes in the intima are the changes of chronic endarteritis I think there can be little doubt. In this respect Dr. Meigs is right. No overgrowth of connective tissue which the pathologist ever encounters is conservative in the sense claimed by Dr. Johnson, although it may for a time contribute to the strength of the blood-vessel, just as the hyperplastic connective tissue in the wall of the aneurism helps for

a time to resist the bursting of the sack. In aneurism its formation is irritative, reactive, the offender being encroaching blood as the coats yield to its pressure. So the overgrowth in the intima in renal disease is the result of inflammation produced by irritating substances in the blood, whatever these may be.

On the other hand, the thickened middle or muscular coat I regard as a true hypertrophy. It undoubtedly exists in the kidney, at least, and its nature is unmistakable. Such muscular overgrowths can only occur here, as elsewhere, as the result of increased function and must be conservative. How this increased functional activity is brought about we may not be in a position to decide with certainty, but since the muscular tissue of the heart and that of the vessels always co-operate in health, it is reasonable to suppose that in disease what produces an overgrowth of one is responsible for it in the other.

In a long and very careful paper on the "Relation of Heart and Kidney Affections," read before the Association of American Physicians at Washington in September, Alfred L. Loomis¹_{Nov. 10} first calls attention to the fact that it is not hypertrophy but a failing heart which is to be feared in Bright's disease, and that, while writers have much to say with regard to cardiac hypertrophy, very little reference is made to cardiac degeneration as secondary to hypertrophy. The hypertrophy is conservative and compensatory, and should not be arrested if it could, save by removal of the condition for which it compensates. He further says that his clinical and pathological studies in the past five years have forced upon him the conviction that simple cardiac hypertrophy is not found in so large a proportion of cases of Bright's disease as are reported by English and Continental observers, and that when it is associated with extensive changes in the glandular structure of the kidney it is due to primary arterial rather than renal disease. It should be remembered, too, that this is essentially the view of Potain.¹⁷_{Feb. 18} The most constant changes he has met with in current Bright's disease are dilatation of the cavities and degeneration of the heart walls, and, in most cases where he has found tubular and interstitial changes in the kidneys in addition to obliterative arteritis, cardiac hypertrophy when present was associated with degenerative changes in the heart walls and dilated cavities. Where there were no obliterative changes in the vessels he found no true cardiac

changes, but rather the changes characteristic of the Bright's heart; whence the broad statement by Dr. Loomis that hypertrophy is not a characteristic change in chronic Bright's disease.

Potain,¹⁷_{Feb. 16} in a lecture on the "Circulatory Affections in Bright's Disease," referring to the hypertrophy of the heart, the galloping murmur, and the increased arterial tension, says that the establishment of the basis of relation between these conditions is a task the more difficult because there is always in the economy a necessary reciprocal relation between the different conditions which produce them and certain influences reacting upon each other. First, the increase in arterial tension, for the explanation of which three hypotheses exist: (1) augmentation of cardiac energy; (2) increase in the mass of the blood; (3) exaggerated resistance in the peripheral vessels. Taking these up seriatim, he shows that the first is absolutely without effect. The second, increase of the mass of the blood, is similarly disposed of. The third agency, the contraction of the peripheral vessels, is regarded as of greater moment, the influence of the contraction of the little vessels having been demonstrated by physicians and physiologists, and the greater the contraction of the vessels the more the tension is increased. As to where the resistance is in Bright's disease, some have localized it in the arteries, since these are thickened and very hard; but to this it is replied that there are many other subjects with the arteries thus affected, and yet the pressure is small, one to one and a half centimetres, while in Bright's disease it is often ten. Hence it is not in the arteries, nor can it be in the veins. It must, therefore, be in the capillaries, which explains the fact that, notwithstanding the high tension in the arteries, the circulation in these vessels is reduced and an anæmic aspect is the result. While it is true that in some forms of kidney disease the capillaries of the kidney are destroyed to a considerable extent, their destruction is not sufficient to explain the high degree of tension in the arteries. Nor do we need any permanent increase in arterial pressure in consequence of nephrectomy or ligation of the renal arteries. Further, if the resistance lay in the renal capillaries only, there would be exaggeration in the peripheral circulation, the reverse of which is true. The resistance must, therefore, be in the capillaries of the whole body. It will be remembered that Bright himself suggested that it was impurity of the blood which caused the capillaries to

resist its onward flow. Potain endeavored to test this by injecting urea, uric acid, and extractives into the blood, and found there was a slight retardation of the current, but too slight to be responsible. He thinks it is necessary to admit an alteration in the capillaries themselves, either in their structure or vitality, and quotes the now generally rejected arterio-capillary fibrosis of Gull and Sutton. Potain is first forced to refer these phenomena to reflex action, in support of which he says the kidney is the point of departure for certain reflexes going to the periphery, as when unilateral lesion of the kidney produces one-sided œdema of the body, whence one may suppose the opposite condition possible—a reflex producing vascular contraction and peripheral ischæmia. This he regards as supported by the results of those experimenters who, having interrupted but not occluded the nourishing artery of the kidney and ligated the ureter, had produced a renal affection with increased arterial pressure and hypertrophy of the heart. This pathological life of the kidney may be supposed to give life to reflexes which act upon the heart and peripheral circulation. How these reflexes come in interstitial nephritis and are absent in catarrhal he admits to be a difficult question, to which there is at present no satisfactory answer.

Passing on to the symptom, hypertrophy, he premises that in this condition of the heart, from any cause, there is an increase in the width of the muscular fasciculi rather than in their number, and a proliferation in the nuclei and fibres of the intermuscular tissue, involving all connective tissue and predominating in some parts, as the pillars; and he thinks the overgrowth does not add to but rather retards the growth of the muscular structure. The blood-vessels of the heart are thickened, as they are generally throughout the economy, but more here than anywhere else except the kidney. Corresponding to the overgrowth of connective tissue, the vascular channels grow narrower, the nourishment of the muscles is interfered with, the veins of the hepatic system are also involved. Thus the heart is hypertrophied, sclerosed, and degenerated. As to its causes, it has been suggested that hypertrophy is due to the retention of pure blood, which may have a slow and secondary action, while it is well known that hypertrophy may occur without it. Reflex action is again called into play to produce the frequent contractions, but this also is

regarded as insufficient. He concludes that the most important factor is the resistance which the heart meets in the arterial pressure, which is compared to the resistance afforded by a narrowed aortic orifice. The galloping rhythm is frequently present in interstitial nephritis, and is there very sharply accentuated. Potain regards it as a diastolic shock of the ventricle while under the influence of strong tension by the blood. It succeeds the second sound, so that in the heartbeats of a certain frequency the abnormal sound is midway between the two normal sounds and the long pause. Normally the penetration of the blood modifies the form of the heart, making it spherical, but when the heart has become hard, as in hypertrophy, and a little fibrous, the cavity can no longer be distended on account of the resistance of the elastic wall.

Prognosis.—In a paper on the prognostic significance of blood pressure in acute renal disease, Broadbent_{u. 10}⁶ said that, although higher arterial tension was present in almost every form of kidney disease, he had twice seen low tension when symptoms of renal cirrhosis were present. In acute renal dropsy when the pulse-beat is *short* and easily arrested, temporary dilatation and weakness of the left ventricle is indicated. A continued defect of tension might be due to cardiac weakness, and this is of unfavorable prognostic import. In other cases it indicates diminished peripheral resistance, which is also of bad import. Dr. Broadbent pointed out that the almost certain cause of albuminuria was the languid movement of blood in the renal capillaries, and the indication here was to improve the circulation. Under a mixture of iron, sulphate of magnesia, and nux vomica and digitalis the dropsy diminished, the pulse became of better volume, less compressible, and the albumen diminished to little more than a trace. The patient was allowed to get up too early, and this brought about an increase in the albuminuria. Imperfect development of blood pressure showed the nature of the patient's constitution and might be made use of in prognosis, as indicated by long illness and the necessity of the use of vascular stimulants. Dr. Maguire had found cases of high tension best relieved by doses of calomel and salol, low tension by nux vomica and iron.

In a reply to Dr. Broadbent's communication, Solomon C. Smith,_{u. 11}² while admitting the correctness of the former's observa-

tion, said the explanation was both unnecessary and deficient in probability. Putting their influence on one side, the three principal factors in the production of arterial tension are heart power, peripheral resistance, and the mass of blood to be propelled. With increased peripheral resistance, heart muscle developing and tissue waste going on at a nearly normal rate, we have the most typical examples of high tension, as seen in men who, though suffering from chronic granular kidneys, are struggling to do the work of health. If, however, as is apt to occur in acute conditions, the heart does not develop power in proportion to resistance, we find the pulse still persistent, but not so hard. Persistency of the pulse, as shown by the sphygmograph, commonly spoken of as a trace of high tension, does not necessarily indicate grave tension, nor even absolutely increased peripheral resistance. It only shows that the resistance is increased relatively to the propelling force and is found not uncommonly to co-exist with great softness or compressibility.

Shortness of pulse is, however, a different affair, and is seldom found with increased peripheral resistance common to all forms of Bright's disease. Any interference, however, with the mass of blood that is propelled may, for a time, take away the tension and persistence and leave the pulse weak and short. We see this after bleeding, sometimes after purging, and Smith thinks it possible that in Broadbent's case the course of the disease had so interfered with the mass of blood as to produce shortness as well as compressibility of the pulse, and the condition can therefore be explained without calling on the hypothesis that the capillaries and arterioles were relaxed. The heart was very weak, and there was no increased tissue change to produce excess of excrementary matter and, therefore, of resistance, so that there was no likelihood of any increase of tension. He supposed that the disturbance of both mass and quality of blood produced by the large dropsical effusion and extreme albuminuria would, like bleeding or purging, be sufficient to produce this shortness of pulse.

While compressibility of pulse is not uncommon in the latter stages of chronic renal disease, such shortness as to be suggestive of diminished peripheral resistance is chiefly to be met with in cases in which some intercurrent malady, such as paralysis, has so altered the patient's general condition as to food, waste and

blood production that the mass of blood to be moved is lessened. As a fact, we do see men whose pulses have formerly been so tight as to burst their arteries, leading an invalid, semi-vegetable existence, with pulses beating shortly and slack arteries, the peripheral resistance being still sufficient to oppose the passage of quantity, but the quantity being no longer there, the amount to be propelled is well within that which can be resisted.

Treatment.—*Pilocarpine*, in large doses and long continued, is recommended by D. Benezúr and S. Csátáry, assistants to Prof. Wagner in the medical faculty of Buda-Pesth. The preparation used was the chloride, and the following is a summary of their results ⁵⁹_{July 21}: 1. The patients become accustomed to the pilocarpine, and even doses as large as 0.06 gramme (one grain) do not at a later period produce such disagreeable after-effects as doses of 0.01 gramme (one-sixth grain) at the beginning. The injections of pilocarpine should not be discontinued in consequence of symptoms which had been considered dangerous. 2. The effect of pilocarpine on the daily secretion of saliva, sweat, and urine, and as well on the daily oscillations in the amount of hæmoglobin in the blood, is in most cases regulated by the stage of the disease and the quantity of liquid taken. 3. The œdema disappears the more rapidly the larger the dose of pilocarpine and the less the quantity of liquid taken. 4. Pilocarpine considerably increases the density of the blood for from four to five hours. 5. The hydræmia in Bright's disease does not depend on the amount of the œdema. 6. The quantity of hæmoglobin in the blood diminishes, that is to say, the hydræmia increases, when the general condition of the patient is impaired during the course of the disease. 7. When used according to above-mentioned principles, pilocarpine will be found in most cases of Bright's disease, even when hot baths and other diaphoretics prove useless, always to diminish dropsy to such an extent that the patient is more or less protected against dangerous uræmic attacks. In this way it may be possible to obtain a relative cure; that is, in secondary granulated kidney.

A number of years ago *fuchsin* was recommended by an Italian physician for Bright's disease, but made little impression. It was tried by numbers, including myself, with no satisfactory results. Recently, Cortezao, another Italian, ⁴¹_{Aug. 20} has again employed it with apparent good results in three cases. He used the

following formula: Fuchsin medicinal, 0.2 gramme ($3\frac{1}{2}$ grains); aquæ destillatæ, two hundred grammes (fifty drachms); ol. menth., 0.13 gramme (two minims); syrupi simplicis, q.s. To be taken at once. After this mixture was used, Cortezao noted that the œdema was scarcely visible, that the urine contained only a small quantity of albumen, and after the second dose the œdema and the albumen both disappeared. The remaining anæmia was easily treated with a preparation of iron, so that the patient soon entirely recovered. A second case, a young girl, was similarly treated with the same results. The third was a man who had been ill more than a year, and in whose case different remedies had been tried without result. In this case diaphoresis was moderately obtained in order to more clearly demonstrate the action of fuchsin. Notwithstanding the considerable œdema and enormous albuminuria, there soon followed a diminution of the former, but not of the latter. The patient was then placed on a milk diet, upon which he had long been, and fuchsin alone used, which was increased to forty centigrammes ($6\frac{1}{8}$ grains). After this dose was taken for five or six days, the œdema of the lower extremities disappeared and the urine became free from albumen. The writer says that such recovery could not be regarded as a coincidence.

In the paper already quoted, Gaucher³ deduces important therapeutic results, and says that for those suffering from Bright's disease, *bouillon*, or *broth*, is a poisonous solution. It is dangerous in all maladies, and even in healthy individuals extracts of meat, concentrated broths, and meat powders, which, besides the toxic mineral salts, chiefly of potash, contain organic poisons and excrementitious matters, the noxious action of which has been demonstrated by himself. My own experience strikingly confirms the conclusions of Gaucher, as illustrated especially in a series of observations on a case of so-called normal albuminuria, wherein the use of beef-tea invariably produced an increase in the albumen.

George Alfred Carpenter¹⁵ reports several cases occurring in the Evelina Hospital for Sick Children, in which harmful results succeeded the use of the *hot pack*, prepared as follows: A blanket is soaked in boiling water and wrung out. The patient is then placed in this just as hot as can comfortably be borne, usually a temperature of 130° F. (54° C.), and completely enveloped in it as far as the neck. A mackintosh or waterproof is then wrapped

around this, so as to exclude, as far as possible, atmospheric influences, and, finally, a thick blanket, doubled, is laid over the patient. The pack is changed hourly, and the child is out of the pack just as long as it takes to remove the disused one and replace it by another. Each repetition of the pack is followed by a profuse sweat. The harmful effects referred to were supervention of high temperature, which in one instance reached 107.6°F. (42°C.), with delirium, burning-hot dry skin, livid face, blue skin, and extreme restlessness. In another there was a capillary and pustular eruption, one case out of four terminating unfavorably. I was struck, in reading this case, with the extraordinarily large doses given to some of these little patients. Thus, a boy of seven was given one-sixth grain (0.01 gramme) of pilocarpine subcutaneously, twice daily; potass. citrate and tartrate, each one drachm (4 grammes); magnesium sulph., three drachms (12 grammes); tinct. of digitalis, five minims (0.3 gramme); water, four drachms (16 grammes) three times daily.

Thomas H. Pope^{19 Apr. 21} reports five out of fifteen cases of chronic parenchymatous nephritis successfully treated with *bichloride of mercury*. He prescribed the bichloride partly because he did not know what to do, but principally because he knew it to be a tonic, an alterative, and useful in inflammation elsewhere, and that it would promote absorption in morbid growths. He gave it in doses of one-eighth of a grain (0.008 gramme) three times a day, in combination with small doses of ammonium chloride in association with acetate of potash in drachm doses (3.89 grammes) once or twice a day, and sweet spirits of nitre. All of the sixteen cases apparently recovered. In all there was albumen in considerable amount and in some it had persisted for months.

NEPHRITIC COLIC.

Wilts' Suppression of Urine.—A remarkable case of total suppression of the urine lasting for fifteen days is related^{100 Mar.} by Waldo Briggs. A man thirty-two or thirty-three years of age, weighing one hundred and ninety to two hundred pounds, had ushered in this condition by an attack of renal colic. It had continued fourteen days up to the time Dr. Briggs saw him, in spite of all treatment. During this period he had had several attacks of nephritic colic, confined entirely to the right side, and had also gouty rheumatism. After each attack of colic he had passed a small, elongated uric

acid calculus about the diameter of a knitting-needle and three-fourths of an inch long. There was uneasiness and discomfort, rather more marked on the left side. There was no urinous odor about the body, but there was finally in the breath. There was extended dullness over the left kidney. There was no stone in the bladder nor urine and absolutely no symptom of uræmia. Laparotomy was decided upon, but both kidneys were found to be impacted with calculi, and, it being evident that no further surgical interference was possible, the wound was closed. Six and a half hours after the operation the patient had passed sixteen ounces (498 grammes) of urine, and after this passed urine freely, eight ounces (249 grammes) in the following night. Subsequently, however, he did badly and died forty-eight hours after the operation. The autopsy discovered both kidneys impacted with calculi.

Diagnosis.—Rendu,¹⁵² in a report on a case of nephritic colic complicated with faecal impaction, called attention to a rather difficult diagnosis, and lays stress upon the following: 1. The value of the true symptoms of testicular pain, as characteristic of calculus impacted in the ureter at an early stage, and iliac pain exaggerated by pressure, as characteristic of the accumulation of faecal matter in the rectum. 2. The value of apyrexia in eliminating peritonitis and true typhlitis. 3. The possible coincidence of these two conditions.

Treatment.—M. O. Lund, of Christiana,³ reports a case of nephritic colic in which antipyrine was used with good effect. The patient was sixty-three years of age and had suffered during six years from time to time with such attacks. Morphia having lost its effects, antipyrine was given in doses of a gramme (fifteen grains). Relief was immediate, but after he had been accustomed to the remedy the effect was sometimes not constant. Subsequent recourse to the morphia produced its effect. I have myself used antipyrine in doses of fifteen grains (one gramme), frequently repeated, with apparent advantage in nephritic colic.

FLOATING KIDNEY.

In a new work issued during the past year on floating kidney, Lindner¹¹⁴⁷ declares that *floating kidney is the most frequent anomaly in the female subject*; and, according to his experience, out of every five or six women one has a floating kidney. In

examining a patient he always stands at the right side, places the right hand against the anterior abdominal parietes, and then presses the left against the back of the lumbar region, so as to press the kidney forward. The patient is then placed on her side, with the knees drawn up. By sharply shaking the body, the kidney, if movable, will fall forward. Repeated examination is sometimes necessary to detect the abnormality. He finds that the floating kidney affects the nervous organization of some women more or less unfavorably, but is opposed to operations unless the patient's life is in danger, which occurs very seldom. He has, however, collected the records of thirty-six nephrectomies and twenty-nine nephrorrhaphies. He prefers to treat the abnormality with careful bandaging, reporting twenty-four cases where bandages proved successful. I am confident, from personal observation, that floating kidney is much more common than is supposed. If the trouble be taken to examine at autopsies, it will be found very often in women that the right kidney is quite movable as compared with the left, and it is easy to conceive that much slighter degrees than are commonly detected might be recognized by the method of Lindner. The rarity of symptoms seldom suggest examination.

Carl Schütze¹¹⁴⁸ has also recently published a brochure on floating kidney which is a statistical study from the etiological stand-point. To ten cases personally studied in Zuelzer's polyclinic in Berlin he has added ninety of the more fully reported cases collected in literature, and subjected the whole to careful analysis. In contrast with the statement of Lindner we find that of Epstein, that floating kidney was found only five times in three thousand six hundred and fifty-eight necropsies, or one in seven hundred and thirty-two. In explanation of this latter, Landau says that the movable kidney tends in the cadaver to settle spontaneously into its normal position, and thus to be overlooked; hence the importance of examination in every case, as already suggested. Landau, from an examination of records from 1870 to 1879, was able to find the records of only four cases out of six thousand necropsies. Although it may be congenital, the most common period of life is from the twenty-fifth to the forty-fifth year. Ten cases, however, are noted in the first decade of life and four in the seventh. In four hundred and seventy-four cases four hundred and five, or 85 per cent., were females; sixty-nine, or 15 per cent., males.

The right kidney is much more frequently displaced than the left; according to Schütze's observations, ⁹_{Apr. 21} the right sixty-five times, the left eighteen, both fourteen. The statistics of Landau, Epstein, and Hare are in close accord with these figures. Schütze's cases go to show that laborious occupation and strong bodily effort are of less importance etiologically than that general relaxation of tissues which comes of an inactive, sedentary life.

The events of such a life in a woman, menstruation, abortion, miscarriage, parturition, are of great etiological moment, and to this general category must also be referred dislocations and diseases of the uterus and appendages. Pregnancy has been frequently accused of causing dislocation of the kidney, but Fritsche shows that the gravid uterus does not drag the kidneys from their normal position, but tends to restore them when displaced. Very important among the causes is the relaxation of the abdominal walls which follows frequent child-bearing, and the pendulous belly consequent to this condition; yet Schütze found among all his cases suffering from this affection only two cases of pendulous abdomen. Wasting diseases, violent concussions of the body, tight lacing, hydronephrosis, and secondary disease of the kidney itself are assigned as causes. Especially frequent as a cause is said to be rapid wasting of the body.

Beumer collected, up to 1878, forty-eight cases of simple wandering kidney. To guard against the catastrophe of a wandering kidney, whose fellow is functionally inactive or altogether absent, it is necessary to determine by internal palpation the presence or absence of the second organ at the time of operation. H. Braun regards the presence of congenital defects or anomalies of the sexual organs as suggestive of congenital defects or anomalies of the kidneys. In thirteen females having a single kidney Beumer found eight to present some developmental defect of the uterus or of the vagina corresponding to the renal deficiency.

Nephrorrhaphy is to be preferred to the extirpation of the sound kidney. S. W. Gross's early collection of seventeen cases with nine good results is cited in favor of the former. More recently, Braun, Küster, Esmarch, and others have reported cases with a preponderance of favorable results.

Grant, of Melbourne,¹³⁹ also treating of floating kidney, con-

cludes: 1. That the mobility of the kidney, even though slight, is no mere anatomical curiosity, but a condition of real clinical importance, producing serious disturbance of function in various organs. 2. That it produces its effects chiefly by reflex irritation, and but little by its mechanical action. 3. That the irritation may influence the motor, sensory, or secretory functions of the organs affected. 4. That variations in the character and intensity of the symptoms may be accounted for by variations in the intensity of the irritation, minor intensity stimulating and major intensity paralyzing certain reflex centres. 5. That the so-called strangulation of the kidney is probably due, not to the chemical or inflammatory obstruction, but to sudden and extreme intensity of the irritation. 6. That in all cases with obscure abdominal pains systematic search for a movable kidney ought to be made. 7. That a certain peculiar localization of intestinal disturbance forms presumptive evidence of movable kidney. 8. That the diagnosis depends on palpation, inspection, percussion being of no value. 9. That, as the condition does not threaten life, no operation involving danger to life is justifiable. 10. That mechanical appliances may palliate but cannot remove the symptoms. 11. The rational treatment consists in endeavoring to restore the natural pad of fat and in diminishing the reflex irritability, and that for the latter purpose codeia is peculiarly adapted on account of lessening the irritability of the efferent fibres in the nerves of the abdominal viscera.

Treatment.—In addition to the fact relative to treatment given above, Niehans³⁸⁶ ¹_{No. 12, July 21} claims to have used with excellent results an apparatus for holding the kidney in place. It consists of a pad pressing in front of the kidney attached by a ball-and-socket joint to a steel band fastened below to an ordinary double truss. It is also secured in position by an elastic band around the waist, being applied while the patient is lying down, after the kidney has been replaced. It is removed during the night. The patient upon whom he tried it was in a state of constant suffering and could not stand or sit for over ten minutes without being obliged to lie down. Relief was immediate and marked. Some months later she stated that she was free from pain while she wore the apparatus, but that when it was removed and she went without it the pain returned in a quarter of an hour.

HYDRONEPHROSIS.

Intermittent.—This term was applied by Leopold Landau^{Nov. 18} to an accumulation of urine in the pelvis of the kidney from some undefined cause, wherein there is a sudden emptying and subsequent recurrence. The most remarkable form is that exhibited as a bilateral spasm of the ureters, causing anuria. Landau had observed a specimen of similar kind in the dead body, in the damming of pus in the ureters, the latter contracting so firmly that not a drop of fluid could pass. Two other kinds of occlusion have occurred, one the direct dragging and pressure of the ureter against the pubic arch, and the other acute flexure or twisting of the ureter or from insertion at an acute angle. An instance of the first was caused by a prolapsed and irreducible uterus, reported by Virchow in 1846, the patient dying of uræmia. The second cause is common, as shown by Cohnheim. As to acute-angled insertion, while Virchow considered that it was congenital, Simon held that it was rather the consequence of the obstruction, that when the hydronephrosis occurs, and the insertion of the ureter is not in the first place acute-angled, it must take an acute-angled course, and suffer lateral pressure from the gradually enlarging renal pelvis. The acute-angled insertion could not be congenital in the majority of cases, but it is remarkable that the affection is most frequent upon the right side, a fact which he considers favors the assumption that the acute angle is acquired and indeed produced by a movable kidney. The kidney sinks and the hydronephrosis is caused by acute flexure or twisting of the ureter.

The symptoms in Landau's five cases were fairly constant. All complained of occasional uneasiness and of the feeling of a foreign body; one of attacks resembling renal colic. The objective symptoms were not striking at the commencement, and the presence of a tumor only can justify the assumption that an intermittent hydronephrosis may exist. Puncture was not always reliable, as the sac did not always contain urinary constituents, for after a time these may be absorbed and nothing but clear, watery fluid be present. As to treatment, Landau opposed nephrectomy in permanent hydronephrosis and still more in the intermittent form, as one could hope that after emptying the sac further flexion of the ureter might be prevented. The disease might become pyonephrosis, and if the other side then became affected the patient was lost. Grave

symptoms, therefore, might justify operation; but excision of the kidney should not be the first choice. There are two methods of treatment, one being the formation of a fistulous opening. Landau had a patient with a fistula for eight years who was quite well otherwise. In the second case the fistula closed and the patient, a woman, was free from the hydronephrosis. Hahn had proposed to stitch the sac as high in the abdomen as possible. A third method was put into practice by two of his patients, who, by lying in a suitable position or kneading, succeeded in completely emptying the sac into the bladder, so that by passing all the urine they were able to obtain comparative comfort.

SYPHILIS OF THE KIDNEY.

In a paper on this subject, Tommasoli, of Rome,¹⁷_{Sept. 1} makes the following summary: (1) There may be manifestations of renal syphilis in all stages of the malady, either congenital or acquired; (2) the interstitial gumma is very rare, and presents itself only in the last stages; (3) albuminuria and the diverse manifestations of Bright's disease are the ordinary clinical manifestations of renal syphilis; (4) as to prognosis, it is favorable in the first months of infection. It is the graver the slower the disease. The prognosis should be guarded and becomes the graver the more the disease is prolonged; (5) treatment by mercurials is indicated, and is followed by successful results if the affection has not existed too long. In advanced syphilis the mixed treatment is to be preferred, but in the last stages of the disease iodide of potassium is the only truly efficacious remedy.

Jaccoud¹⁰⁰_{Oct. 28} says: (1) the renal lesions of syphilis are not infrequent; (2) syphilis may attack the kidney at all stages, and if the late renal syphilis is the more common than the early form, the latter, nevertheless exists; in fact, primary renal syphilis may occur either at the same time with the roseola or a little later, *i.e.*, in the period of the papillo-squamous eruption.

Clinically, the early form presents itself in two different aspects: 1. More frequently there exists for a long time a simple albuminuria more intense and persistent, and characterized by the presence of albumen alone. Nevertheless, if treatment is neglected, true albuminous nephritis may result. 2. In other cases, though less common, the disease is introduced with the symptoms of acute

scarlatinal nephritis: albuminuria, fever, lumbar pains, anasarca, pulmonary œdema, etc. In one case Borckmann noted uræmic phenomena at the same time. In the management of the first group, the mixed treatment is necessary, iodide of potassium associated with mercury; with this combination there follows a rapid improvement, and even a total disappearance of the albuminuria. In the acute form, however, it is necessary to have recourse to purgatives and even blood-letting, after which, the dangers of the acute stage being removed, the mixed treatment is to be used; but in this form it must be kept up for a long time for the cure to be established, as in one of Jaccoud's cases, where four years were required. He says the milk treatment should also be associated with it, the patient being advised to take as much as four litres a day. As to diagnosis, the condition is easily overlooked unless the cause be sought for. Jaccoud considers it necessary in all cases of syphilis to examine the urine. The acute form may be mistaken for one of simple origin, if a possible syphilitic origin be not remembered.

The most frequent anatomical change is amyloid degeneration, being found in thirty-five out of forty-two cases. The most rare is the gummy granule, seven times out of forty-two. The first is observed in the phase of transition, the second in the phase of confirmed tertiary disease.

There is still another form of renal syphilis in which upon a chronic condition supervenes an attack of acute diffuse nephritis, accompanied often by hæmaturia. The course is rapid, and patients rarely recover. So far as the previous chronic condition is concerned, very frequently death terminates the scene. Out of eight cases cited by Wagner, five perished quickly, three returned to the previous chronic condition.

CONTUSIONS AND LACERATIONS OF THE KIDNEY.

H. H. Mudd, of St. Louis,⁸² reported several cases, of which one, a boy aged five years, had suffered a contusion which on the twenty-first day of injury required nephrectomy. The operation was made through a lumbar incision and the patient recovered. Mudd says that in these injuries the peritoneum is not, as a rule, injured, and that a fluid tumor gradually developed in the lumbar region on the side injured, in one case after a lapse of fourteen days,

and in another on the twenty-fourth day. In another case, though urine had been no doubt present for many days in the retro-peritoneal space, but little inflammatory trouble had developed. In another case the patient was up and about, comparatively comfortable, before the time of the development of the tumor.

He also called attention to the fact that a contusion without serious laceration of the kidney, but accompanied by perinephritic hæmorrhage, might present all the diagnostic symptoms of a rupture, while a destructive laceration of the kidney structures is slow in developing characteristic symptoms. It appears from the recorded cases that there is ample time for investigation of them before operative interference is demanded. This is true when the peritoneum is extensively torn.

The dangerous conditions which may develop during the progress of such cases are shock, septicæmia, cystitis with extension of inflammation through the bladder to the other kidney, and nephritis of the injured organ. Suppression of urine in both organs may occur during the presence of one or more of these conditions. A destructive unilateral nephritis may develop in the contused organ. Cuts, bullet-wounds, and tears of the kidney substance heal quickly. A laceration of the pelvis of the kidney or the ureter is much more likely to leave an untractable fistula. Incision, with inspection of the injured organ, and drainage are to be recommended. A laceration of the kidney may occur without external appearance of injury.

In the discussion which followed, Dr. Dixon, of Kentucky, referred to the case of a man who was thrown from a wagon across his stomach. He had hæmaturia, pain in the loins, and, at first, rupture of the bladder was suspected, but the catheter disproved this supposition. He himself diagnosticated possible injury to the pelvis of the kidney. The patient grew worse, fell into a typhoid condition, and died twenty-three days afterward. There was no tumor. The autopsy showed that there was a laceration of the pelvis of the kidney three inches long.

Two cases of laceration of the kidney ²³⁵_{Mar. 16} were admitted to the Melbourne hospital in November, 1887. One, a blacksmith, aged twenty-three, was knocked down and run over by a cab. He was admitted suffering from shock, and the urine drawn off was found to contain blood. There was great pain in the abdomen, usually

in the right side below the ribs. There was apparent intermission in the hæmaturia and pus also made its appearance, but both disappeared ultimately and the patient recovered. The second case was that of a baker, who fell out of a bread-cart while driving rapidly. There was considerable vomiting during the night, and the next morning he passed almost ten ounces of pure blood. He was also in a state of collapse, but ultimately recovered.

RENAL TUMORS.

An interesting series of primary carcinomatous growths from the stand-point of manner of invasion and of number of instances is met with in the literature of the year. A case of Leblond's, ⁷Mar. occurring in a man aged fifty-seven years, suffering with vague symptoms, presented upon post-mortem section a tumor of the upper extremity of the kidney penetrating downward into the hilus of the organ and invading the walls of the renal vein. Its histological character was that of an epithelioma, in which, resembling an adenoma, there was a marked tendency to the reproduction of the glandular structure of the kidney in all parts of the tumor, and a notable fatty infiltration of its tissues. Lépine, ²¹¹July 28, reports a case of primary cancer of the right kidney, in which there occurred, from adhesions of the tumor and subsequent invasion by its malignant elements, entire obliteration of the inferior vena cava and subhepatic veins, as well as of the renal vessels. There was considerable anasarca, but the urine, excreted entirely by the other kidney on account of the anastomotic circulation, was entirely free from albumen. Gregory, of Chicago, ²³¹Sept. and Wesselowski, ⁶⁰July 14, each publish a similar case, the former from the body of a woman aged twenty-seven years; the latter, in which the invasion extended only into the renal vein, in the case of a child aged five years. A case is also published ¹⁰²Sept. of cancer of the left kidney extending into the renal vessels and upper portion of the ureter, and causing several secondary nodules in the liver. An exploratory incision with a view to decisive operation in case of propriety in this instance had to be closed and the operation abandoned upon finding extensive adhesions of the tumor to the viscera and the sheaths of the abdominal aorta and descending cava. A similar case of primary cancer of the right kidney in a man aged forty-seven years is recorded by Tison, ⁷Oct. 12, in which there was extensive

invasion of the renal vein and cava descendens; there were, however, no secondary deposits in any of the other organs. The affected organ weighed nine hundred and seventy-five grammes. An interesting instance of primary hard cancer occurring in the left kidney of an old man, with invasion into the walls of the colon, is given by Pescher.⁷_{No.12} There was extensive adhesion between the tumor and the bowel, with numerous perforations of the latter, allowing the escape of fæcal matter into the peritoneal cavity. Anderson and Coats, of Glasgow,²¹³_{Jan.} record a case of primary cancer of the left kidney in a patient aged forty-seven years, with secondary nodules in the lungs. There was an extension of the primary growth through the diaphragm to the pleura. The total weight of the tumor was twelve pounds. A similar case occurring in a child and giving metastasis to liver and lungs is recorded by Hauck.⁶⁵_{Aug.} Shattock,⁶_{Mar.10} exhibited before the London Pathological Society an epithelioma associated with calculus in the kidney, the irritation of the stone, in his opinion, either primarily inducing the growth or preparing a focus for cancerous infection. Hoffman, of Baltimore,¹⁵⁰_{July} publishes the history of a patient yet living in whom the symptoms point toward probable carcinoma of the right kidney, the entire train of events dating to a severe blow upon the back from a falling body months ago. A large tumor, probably carcinomatous, of the right kidney of a boy aged two years is reported by Brunner,¹⁹⁰_{Apr.1} weighing eight pounds, involving the right kidney and suprarenal body, with adhesions to the walls of the abdomen, to the intestines, and to the lower margin of the liver and pancreas, the latter organ being almost entirely affected by the malignant process. The liver showed a few foci at its lower border.

In removing what had seemed a large ovarian tumor from a woman aged fifty years, Alexander¹⁸⁷_{Jan.} found it to be a large pyriform sarcoma of the left kidney, the stalk of the pear high in the abdomen and representing the hilus of the organ, the pedicle consisting of the renal vessels and sheaths. The bulk of the tumor from sheer weight had gravitated into the pelvis, and, although there had been bloody urine, the position of the tumor had prevented a suspicion of its real nature. It was readily removed, but the patient died from shock within a few hours. Pertik,¹¹³_{Feb.10} records an instance of sarcoma, of the round-celled variety, in the

left kidney of a man aged fifty years. The tumor presented a lipomatous infiltration.

In a differentiation of these tumors from those of other organs, Stiller⁸⁴_{Aug. 18} urges the following: the unilateral occupation of the abdomen; the spherical contour in contrast with the angular or sharp-bordered growths of liver and spleen; the downward growth as shown by palpation of lower margin (in tumors growing upward from the pelvis only the upper margin may be felt); by the absence of any influence of the rhythmical movements of the diaphragm in breathing when the tumor is fixed against the abdominal wall; the relation to the intestines (in case of small tumors the intestines lie over the tumor, in larger ones they are pushed toward the median side); on the presence or absence of tympany depending upon the amount of intestine covering the tumor; and the bulging posteriorly of the tumor. In his thesis upon malignant renal tumors Guillet¹¹⁴⁰ urges as a symptom of high order the presence of a suddenly occurring and rapidly growing varicocele (first pointed out by Guyon) and the possibility of *ballotement* as described by Guyon. In the matter of treatment, this author, as well as Tuffier,²⁶⁸_{Feb.} in a well-written paper upon the subject, speaks with some reserve as to nephrectomy—only urging its employment in case of early diagnosis; in children, if the general health permits, the opposite holds.

Schlegtendal⁵⁴_{June 1; July 14}⁹ reports a case of true congenital calcareous atheroma of the kidney found at autopsy in a man aged twenty-two years.

An interesting sequence of diabetes is recorded by Turner,⁶_{May 18} in a woman, aged sixty years, dead from gangrene of right foot and leg. On post-mortem the left kidney presented the greater part of the pyramids in a gangrenous condition. A marked line of separation existed, and otherwise the organ appeared healthy, as, too, did the rest of the urinary tract.

An experimentally produced amyloid degeneration of the kidneys in a rabbit was shown before the Anatomical Society of Paris, developing after tubercular inoculation, by Charrin.⁷_{No. 21} The lungs were affected by a tubercular change from the inoculation.

RENAL TUBERCULOSIS.

In a general review of renal tuberculosis Cayla¹⁰⁰_{Feb. 4} asserts that this condition is secondary to a primary focus of tubercular infec-

tion in some other organ or tissue, lungs, skin, digestive or genito-urinary mucous membranes. The writer does not regard with favor the theory of infection through this last path by sexual contact, etc., opposing to this view his clinical observations and a series of experiments performed by him upon animals, into the anterior parts of the urinary tracts of which he injected pure cultures of the tubercle bacillus without causing within fifty days any tubercular manifestations of the parts. The histological arrangement of the anterior portion of the urethra, in his view, militated strongly against this method of infection. Regarded as secondary to tubercular infection elsewhere and usually transferred to the kidney by the hæmatic paths, the glomerules are the first to show invasion, later the tubules; and finally the tuberculosis by downward invasion attacks the lower urinary apparatus. This course of infection may be possibly shown by a case demonstrated by Parmentier, of Paris, ⁷_{Nov. 18}, in which the left kidney was completely broken down, the ureter involved to a great extent, while the bladder showed a few superficial ulcerations and none of the other related organs were at all affected. In a case shown later on before the same body, the Pathological Society of Paris, Halle ⁷_{Nov. 18} pointed out an interesting possibility of sequence. The right kidney was completely caseated; the corresponding ureter the seat of advanced tubercular infiltration and reduced to an impervious cord; the bladder the seat of great interstitial thickening with tubercular deposits about its base, in the posterior part of the urethra, prostate and seminal vesicles. The left ureter and kidney showed marked suppurative changes; but no tubercular deposits were to be noticed in the structure of the ureter, and the character of the inflammation indicated a non-tubercular variety. He regarded the events as of the following relation: a primary right renal tuberculosis; tubercular, obliterating, descending ureteritis; general cystic tubercular involvement; an ascending, non-tubercular, left-sided ureteritis; and a non-tubercular left pyonephritis. Biggs, of New York, ⁵⁰_{Nov. 18} showed before the Pathological Society of that city a tubercular kidney from the body of a young girl in whom no other tubercular involvement save of the lungs was noted.

In speaking of Parmentier's case, Hartmann did not think that the superficial ulcerations in the vesical surfaces were necessarily of later origin than the renal tuberculosis, and he did not

regard as proved the theory of the downward invasion of the urinary tract. Of nineteen cases he has seen, Hartmann records that in seven the tuberculosis was general throughout the genito-urinary tract; of the other twelve, six showed renal tuberculosis associated with tubercular cystitis; while the other six presented healthy kidneys, the tubercular foci in two being prostatic and in the other four in the other genital organs.

Nazaris¹⁸⁸_{May 22} reports a case of renal tuberculosis in a subject whose clinical history is wanting. There was a pocket of suppuration in the prostate body and a small calculus in the bladder, whose walls were very much thickened. These changes, besides the renal tuberculosis, were associated with tuberculosis in the lungs and elsewhere. Marsh⁶_{Nov. 10} records a case of renal tubercular degeneration in a woman without the usual conditions leading to its diagnosis. A firm, fibrous capsule, covering the degenerated kidney, its vessels, and the vena cava, had firmly tied it down and prevented fluctuation on deep palpation, and prevented the escape of the purulent contents from the degenerated organ into the urine. The urine revealed no evidence of the condition and positive diagnosis was withheld during life. Two kidneys from a patient in the Philadelphia Hospital⁶²_{Oct. 1} were shown before the Pathological Society of Philadelphia, the one filled with caseous tubercular material, its mate normal, except that it was supplied with a double ureter. Adler⁵⁰_{July 1} records a case in which advanced tubercular disease of the right kidney was associated with a hydronephrosis of the other, without tubercular manifestation noted elsewhere in the case. A case reported by Küster,⁴¹_{Nov. 1} diagnosed as tubercular invasion of the left kidney, in a female aged twenty years, was successfully operated upon, with removal of the kidney and recovery of the case. Throughout the cortical substance there were a number of tubercles and the medullary portion was the seat of advanced, cheesy degeneration. In relation to operative procedure, Guyon²⁰⁸_{Sept. 1} in a lecture before the Faculty of Medicine in Paris, announced the following statistics of observations in twenty-nine cases:—

Nephrotomies (Nine Cases).

Died	2 (22 per cent.).
Cured	1 } Two fistulæ.
Relieved	1 }
Unknown	1 }
Under observation	4 }

Nephrectomies (Twenty-four Cases).

Twenty Primary.	{	Died	11 (55 per cent.).
	{	Cured	7
	{	Relieved . . .	1
	{	Unknown . . .	1
Four Secondary.	{	Died	1 (25 per cent.).
	{	Cured	3

Results of Nine Autopsies.

Opposite kidney tuberculous,	4
Opposite kidney healthy,	8
General tuberculosis,	2

RENAL CYSTS.

Philippson, of Hamburg, ²⁰_{Mar. 1} concludes from histological examination of a number of cystic kidneys that these cysts may occur both in the renal tubules and in the glomerular capsule from obstruction of the tubules; that next to the obstructions within the canals leading to retention cysts the most frequent cause must be sought for in the hyperplasia and cicatrization of the interstitial connective tissue; that the seat of the obstruction may be either in the membrana propria of the tubule (annular hypertrophy, torsion), or in the epithelial lining (papillomatous growths, hyperplasia, swelling), or in the glomerule (enlargement); that for the highest grade of cystic degeneration Virchow's theory of pelvic inflammation, with inflammation of the calyces and then of the papillæ, is to be regarded as the best established; but that for a large class of cases (among which is a case cited by the writer) no such histological causes are to be found. Danforth, of Chicago, ⁶¹_{Oct. 30} in a comprehensive paper upon the evolution of the cystic kidney, classifies the various causes of the condition as follows:—

1. *Diathetic causes*—with these varieties:—
 - (a) Excess of saline elements of the urine.
 - (b) Tuberculosis.
 - (c) Carcinoma.
2. *Congenital causes*:—
 - (a) Floating kidney, with consequent twist of ureter.
 - (b) Congenital hydronephrosis.
 - (c) Congenital degeneration of glomeruli.
3. *Mechanical obstruction* consequent upon disease of pelvic organs.
4. *Traumatic causes*.
5. *Pathogenic cysts*:—
 - (a) Dermoid.
 - (b) Hydatid.
 - (c) Cystic metamorphosis.

Lewin ²⁸⁸_{May 18} presented before the Anatomico-Pathological Society of Brussels the kidneys of a man dying the day following his entrance into the hospital, while eating his breakfast. On post-mortem examination a widespread sclerotic condition, marked in the lungs, liver, and spleen, as well as kidneys, was noted. Both kidneys were enlarged and apparently made up of a large number

of cysts, varying in size, held together by the surrounding hyperplastic interstitial connective tissue, among the fibres of which were to be seen the remnants of the normal structure. The cysts, formed from the choking of the tubules by the contracting new connective tissue, were lined by flattened cuboidal epithelial cells, and filled with a colloid material probably due to degeneration of the former glandular cells lining the walls of the tubes.

In discussing a case of cystic kidney, Küster⁴¹_{Apr. 2} speaks of the primary stage as a catarrhal condition of the pelvis and calyces of the kidneys with swelling of the epithelial cells, a mechanical obstruction to the exit of the urine, and the production of temporary hydronephrosis, ready to disappear and recur from advancing local derangements. Dupré⁷_{Nov. 11} showed before the Anatomical Society of Paris a large, single cyst seated at the upper extremity of the left kidney of a woman. In the calyx corresponding to this zone there was a calculus, and in the structure of this part of the kidney blocking the emptying tubes of the pyramid was a second calculus. From the position of the cyst so near the surface of the kidney, and from the fact that its walls showed no epithelial lining, it was regarded as questionable whether the cyst was not the result of a primary local inflammatory condition which influenced the production of the calculi as well. Mackenzie²_{Apr. 7} demonstrated the kidneys of a woman aged sixty-nine years, dead of cerebral apoplexy. Both were cystic to a marked degree, numerous cysts of varying size being found in each kidney. In the right kidney alone within a large number of the cysts were found small renal calculi of oxalate of lime. There was no calculous disease of bladder, ureter, or pelvis. There was no communication between the cyst and the pelvis, but the calculi were not the obstructing agents and from their absence in the left kidney were evidently not the cause of the cystic degeneration, which the author regards as probably due to minute concretions. Pertik¹¹³_{Nov. 1} reports a case of multiple cysts of both kidneys, secondary to a pyelitis of traumatic origin; within the cysts Pertik found a marked quantity of uric acid. Secretan¹⁹⁷_{Mar. 20} reports a single cyst of large size from a woman who died of cardiac disease. The cyst developed in the lower part of the right kidney, and from its size pushed the colon aside toward the median line; it contained one thousand two hundred cubic centimetres of clear liquid, pale, and exhibiting 53 per cent. of urea.

Lejars⁷_{no. 12} presented before the Anatomical Society of Paris two large cystic kidneys removed from a dissecting subject and not diagnosed in life. The left kidney weighed four hundred and eighty grammes, and the right five hundred grammes. Both were crowded with cysts full of a yellow, urinous liquid, containing in some of the cysts a proportion of blood. Guyon, of Paris,²⁰⁶ reports cases of renal cysts associated with calculous nephritis. Marique²⁸⁸_{Mar. 15} has reported a case of some interest from the character of the contents of the single cyst encountered. A localized nephritis had strangled the tubules of the part and a cyst resulted. The contents were chemically allied to blood-serum, but the urine had not at any time given the characteristic albumen tests. This instance might be regarded as an argument in favor of the theory that the entire blood-serum is first passed through the glomerular tuft and later on the albuminous elements are reabsorbed by the active canalicular cells. An interesting anomaly of the renal circulatory apparatus producing, or at least tending to preserve, a hydronephrosis is reported by Decressac.⁷ From the lower and posterior border of the left kidney of the subject passed an extra renal vein accompanied by a small artery and the enveloping connective tissue, emptying into the proper renal vein. The ureter was somewhat displaced backward and passed over and behind this anomalous vessel. The pelvis, becoming the seat of a serous collection, bulged forward and dragged the ureter at a sharp angle downward and forward over the anomalous vein, and thus by the torsion produced complete obstruction to the flow—in which condition the specimen was obtained. The greater part of the kidney was cystic, probably secondarily. Klippel⁷_{no. 7} demonstrated a large single cyst filled with thick, creamy pus, through which thin, delicate membranes were to be seen. The specimen occurred in the lower portion of the right kidney of a tuberculous subject, and was about the size of a large orange, occupying the two lower pyramids entirely. The cyst was regarded by the writer as of hydatid origin, although no hooklets were discovered in the contents. A large hæmatic cyst of the left kidney was shown before the Anatomical Society by Lejars.⁷ It occurred in an apparently healthy woman aged forty-eight. She had, however, complained of lancinating pains in the left hypochondrium and flank, and upon palpation a fluctuating tumor could be detected. The tumor was

in the lower part of the kidney and encroached considerably upon the parenchyma of the organ. It was full of liquid blood with a few clotted fragments, divided into subspaces and irregularly alveolar.

Benedict²⁵⁹_{Sept.} records an interesting case of abscess of the kidney, secondary to vesical disease. Over a year before the patient's death lithotomy had been successfully performed upon him, but the fistula never closed. Nine months later a swelling in the lumbar region was opened and about a pint of pus evacuated, and seven months later a second evacuation took place spontaneously. On post-mortem the left kidney was found almost entirely degenerated, adherent by a thick cicatricial and adipose structure to the posterior or abdominal wall. The sinus in this region was found penetrating the degenerated organ to its centre. The right kidney was the seat of numerous multiple abscesses about the size of a pea, and its pyramids here and there showed advanced degeneration. Biggs⁵⁹_{July 28} showed before the New York Pathological Society two kidneys from a subject of his, one normal, the other containing six or seven cysts varying from the size of a pea to that of a filbert, filled with a fatty, pasty mass, composed of cholesterin, fat-globules, epithelium, and compound granule cells. Heath¹⁷⁰_{Jan.} details four instances of this condition, marked by the usual characteristics of perinephritic abscess.

URÆMIA.

A valuable contribution to the literature of uræmia has been furnished by Dr. Carter⁶_{Aug. 28} in the Bradshawe Lecture for the present year, consisting of a careful review of the theories and recent work (especially French) upon this subject. The two theories of production, mechanical and chemical, of the complex variety of symptoms grouped under this title are both, in Carter's opinion, of value; but he regards the former and older—especially as set forth by Traube—as being of influence by a different rôle from that spoken for it by its originator. Carter believes that the primary agencies are certain alkaloidal substances which cannot be excreted on account of inefficiency of the kidneys; and that the variations in quantity of these substances, due to varying conditions of vascular dilation and blood pressure, delivered to one or other locality of the brain or to its entirety, may go far toward

an explanation of the apparently widely separated phenomena of uræmic attacks.

These chemical substances, mentioned by Carter and detailed also by Artigalas⁷⁰ in an excellent *résumé* of the subject before the Hospital of St. André, may be classed as follows: (a) urica; (b) ammonium carbonate from changes in the vascular system or from resorption from the alimentary system; (c) potash salts from aliment; (d) uroxanthine, urochrome; (e) excrementitious matters (ammonæmia) and organic poisons (ptomaines). Of these agencies urea is really of the least significance, while, after excluding excrementitious products and organic poisons, the potash salts are of utmost importance. A case of some value is narrated by Carter bearing toward the proof of the causative influence of these organic poisons in the production of uræmic symptoms. In a uræmic patient in whom gastro-intestinal symptoms, especially vomiting, were marked, there was an unexpected cessation of the vomiting; and some hours later, with symptoms of collapse, the patient suddenly died. Within twenty-four hours, when there was scarcely any possibility on account of the coldness of the weather and the precautions taken that any decomposition should have set in, the body was brought to post-mortem section; and, singularly, two of those present, the operator and the senior porter, whose duty it was to sew up the incision, were immediately seized with giddiness, vomiting, and headache, in each amounting to an attack of some seriousness. In this instance, the author pertinently suggests, could not some substance have been formed in excess just before death, or have been prevented from escape by the cessation of vomiting, to whose influence may be credited, not only the sudden collapse and death of the patient, but also later on, after escape from the post-mortem incision, the above toxic symptoms in men hardened to the ordinary odors and sights of the dead-house?

Jaksch,⁶⁹ in considering the renal affections of children, accepts practically the same view of uræmia, that it is caused by the action of certain poisonous substances contained in the normal urine, which, on account of the inefficiency of the renal functions, cannot escape from the body by this organ. He differentiates ammonæmia as engendered by certain alkaloidal substances occurring in the urinary tract beyond the kidneys from urinary decomposition, and reabsorbed into the system by the altered mucous membrane of the tract.

Laquel,²¹²_{Oct} in a recent thesis upon the "Palsies of Uræmic Origin," contributes a number of interesting observations. In his experience these palsies occur usually in the chronic uræmic states in old cases of interstitial Bright's disease, usually in old persons long ill (he records one instance in his knowledge where a pregnant woman was affected). They are sometimes preceded by various cerebral phenomena; in manner of onset they generally simulate the hemiplegias of central origin, particularly those of cerebral softening. The distribution of palsy varies in the individual cases, but is usually of the hemiplegic type; not so pure, however, as in the real central hemiplegias in that often the face is spared or the palsy limited to a single member. At times motion is completely abolished, but often the palsy only amounts to paresis or muscular weakness of some part of the organism, associated not infrequently with myosis. Those cases in which the paralysis comes on suddenly, just as in an apoplexy, are commonly quickly fatal; where the onset is gradual, especially if the attack be light and treatment be thoroughly pursued, recovery is very common.

Davidson¹⁸⁷_{July} reports a case in which, from the discovery of large bacilli in the urine and the occupation of the woman as a wool-picker, there was some question for a time whether anthrax infection could be excluded. Post-mortem examination, however, confirmed the diagnosis of uræmia. Lancereaux,²⁶⁶ in a clinical lecture upon the subject, reported several cases of uræmic cutaneous eruptions, erythematous, papular, pemphigoid, and pustular. Dauvin,²⁴_{Sept. 30} publishes the notes of a case marked by hæmorrhagic symptoms, expectoration, vomiting, and passage of blood-stained matters by the stool. Jaccoud⁵⁵_{Feb. 11} demonstrated before his class an instance of uræmic invasion with special gastro-intestinal symptoms of vomiting and diarrhœa, not associated with any marked nervous phenomena. A recent case within our knowledge was marked by an onset of vomiting and sudden and total loss of consciousness, persisting several days until death. The left side, not including the face, was entirely paralyzed, while the members and groups of muscles of the right were affected by spasmodic movements and contractions of a choreic nature.

In the matter of treatment, Carter⁶_{Aug. 26} points out the following principles of action, based upon the view of the pathology of the

condition taken by him : 1. Cut off the sources of such urinary poisons as we may reach by limiting the ingestion of the potash salts and substituting those of sodium, by the use of the most simple diet (milk), by thorough disinfection of the alimentary tract, by urging to its best the hepatic function, and by care in the nature of nutrient enemata where these are demanded. 2. Directly or indirectly withdraw or dilute the poison by venesection, purging, sweating, transfusion. 3. Oxidize and consume the poison by exercise or the administration of oxygen or oxidizers. 4. Antagonize the toxic manifestations and overcome special symptoms.

Kelly¹⁴⁷_{Jan.} and Churchouse²_{Jan. 22} each report excellent results in the use of the subcutaneous injection of pilocarpine. Lagenheim, reported by corresponding editor Eklund, of Sweden, commends the subcutaneous injection of large amounts of cocaine. Patrozevsky,²_{Jan. 14} starting from the fact that the benzoate of soda inhibits the formation of urea within the system, gave it in ten cases—successfully in nine. He concludes that it is of service in cutting short the anæmic attacks, the convulsive phenomena gradually disappearing and giving place to natural sleep.

ENURESIS.

In speaking of this condition, Picard,⁴³³_{May 28; Oct. 51} calls attention to the fact that the involuntary muscular fibres of the vesical sphincter and of the compressor urethræ muscles are ordinarily able to restrain the urine ; upon desire to urinate, too, if there be an inclination to resist the desire the voluntary muscles of Guthrie and Wilson at the deep portion of the urethra assist the involuntary ones. If, however, the urethral resistance be too weak or the vesical expulsive force too strong, incontinence obtains ; in children, until the contractility of the sphincters comes into play, and, later on, the voluntary muscles begin to be trained, this incontinence is normal. Townsend,⁹⁹_{Feb. 16} publishes the following statistics : Of three hundred and fifty-five children, one hundred and seventy-nine boys and one hundred and seventy-six girls, taken at random among the lower and middle classes, 77, or 21.5 per cent., were found to be incontinent, the limit of normal continence being placed at three years. The majority of normal infants were found to stop wetting their clothes under one and a half years

of age. Among the seventy-seven incontinent cases, forty-two were boys, thirty-five girls; in forty-seven incontinence was only nocturnal, in two only diurnal, and in twenty-eight both nocturnal and diurnal. In sixty-three it continued from infancy; in fourteen it came on after primary incontinence of infancy had ceased. Buckingham⁹⁹_{Mar. 15} calls attention to a greater prevalence of enuresis among children in winter than in summer, possibly because of the greater perspiration in summer, and, consequently, fuller bladders in winter. Nichols⁹⁹_{Mar. 15} narrates a rare instance of reflex causation in this condition. A boy long treated in vain for enuresis was taken on account of certain nasal symptoms to a specialist, who, after examination, removed a calculus from the nose, the nucleus of which proved to be a boot-button, then recalled as having been thrust into the nose eight years before. The removal was followed by an immediate and permanent cure of the incontinence.

Oberländer, of Dresden,⁴_{July 28} and Reymond³⁰⁴_{No. 40; Oct. 27} add to the etiological list certain abnormalities of the deep urethra. A number of ducts (of Cowper's glands and of the seminal vesicles) open into the deep urethra, and inflammatory action in or about these structures has been noted even in early infancy, under which circumstances a reflex incontinence may readily be aroused. In accordance with this view, where other treatment has failed, Oberländer dilates the urethra by proper instruments, claiming in this manner to dilate the openings of these ducts into the urethra and thus to remove causes for reflex excitation of the vesical muscles. According to him, this measure is often of marked service and entirely free from danger. Von der Goltz¹⁵⁰_{May} reports considerable success in a like method instituted by Bischoff, of Basel, in the incontinence of young chlorotic women.

Burke⁵⁴⁷_{Feb.} reports fourteen cases of nocturnal incontinence. In twelve he found præputial adhesion, and in every case cure followed relief. In one there were no adhesions, but a large collection of smegma was removed and cure followed. The other, a young adolescent, was relieved by repeated introduction of the steel sound to dilate the deep urethra. The writer condemns the widespread employment of circumcision, depending upon the probe or manual force to break up the glandulo-præputial adhesions so common, and which are never at all firm. Settler,²_{July 28} Shattuck,⁹⁹_{Mar. 16}

and others report successful results from the use of electricity. Harkin, ⁶¹_{July 26}, believing incontinence in children due to congestion of the medulla, has employed successfully counter-irritation to the back of the neck, high up, in the form of dry cups, scarifications, or blisters. Max ¹⁷_{May 8} and Burvenich ¹⁴⁰_{June 15} have had marked success from the use of *rhus aromatica*, the latter regarding this drug as somewhat similar to *nux vomica* as a tonic, with an elective action upon the bladder. Gündoben ¹⁹_{Nov. 10} has also employed *rhus aromatica* in eighteen cases—in twelve with excellent results. The other six of his series were all secondary or symptomatic of some grave condition, and upon these the drug had but little, and usually a transient, effect.

CYSTITIS.

Etiology and Symptomatology.—Gautrelet, ²⁴_{May 12}, in a comparative study of the urinary excretion in the diatheses, is led to explain the vesical symptoms by the presence of marked alterations in the normal acidity of the excretion (calculated as P_2O_5). In those diatheses, arthritic, etc., where the acidity is high, in conditions of suppression of dermal excretion (as from cold), where there is marked general increase of waste (fevers, pregnancy, etc.), where, on the other hand, the acidity is replaced by notable alkalinity, as in tuberculosis, scrofula, anæmia, cancer, etc., in all these states the author regards the vesical irritation as due to the chemical effects of the altered excretion. It must remain a question as yet unsolved, however, whether in such conditions as the fevers, and in tuberculosis or scrofula, there is not some specific cause, as the bacillus in tuberculosis, playing the principal agency; and the presence of undoubted tubercular deposit in the vesical mucous membrane in cases of tubercular cystitis would indicate a more simple rôle for the reaction of the urine in this condition than the author would have believed. An interesting case of this last variety was exhibited by Johnston ¹³⁰_{Jan.} in which tubercles were found in the track of an unhealed fistula, in front of the prostate body, and about the base of the bladder, ulcerations about the opening of the right ureter, and tubercular softening in two of the calices of the right kidney. A case of similar nature is reported by Zinsmeister, ⁸⁴_{July 26} in which ulceration of the vesical mucous membrane was specially marked. In both instances the bacilli were recognized. Boldt, of New York, ²⁷_{Apr.} under the term suppurative exfoliative

cystitis, describes a form of cystitis marked by inflammatory separation *en masse* of portions of the mucous lining of the bladder, due especially to posterior displacements of the gravid uterus, to undue or prolonged pressure of the foetal head in labor, or other mechanical causes. The degree of exfoliation varies with the intensity of the cause and the general health of the patient, sometimes amounting almost to perforation. The effects are most frequently seen at the fundus of the bladder, where least protection from outlying structures is afforded.

Painful cystitis—cystalgia—a cystitis without peculiar anatomical features but marked by excessive and intense pain, long duration, continued manifestation of symptoms without any long remission, entirely unrelieved by the ordinary therapeutic measures, constitutes a new variety recently brought forward by Guyon,²⁹⁸ Hartmann,¹¹⁵¹ Lavaux,³⁵ Malicot,²⁹⁰ and other French writers. It is met with especially among women with tubercular cystitis, and commonly follows an overdistention of the bladder in lavage or careless use of vesical instruments. Frequency of micturition and pain are the two symptoms which from their importance and tenacity distinguish this variety from other vesical inflammations. In a case of Marieux's,²⁹⁰ the patient urinated one hundred and twenty times in the twenty-four hours; the totality of urine is, however, but little increased. The pain is deep-seated, ill-defined, usually referred by the patient to the lower part of the bladder, rarely to the gland, the base of the penis, the perineum, or the anus. A case, possibly of this nature, occurring in a young, nervous woman, without apparent local cause, is reported⁹⁹ by Blake. Jonnesco⁷ describes a remarkable case occurring in a man aged thirty years, following fracture of the spinal column in the lumbar region. Upon post-mortem section the bladder walls were found to be hypertrophied and in a state of advanced fatty infiltration, subperitoneal and intraparietal; there was a large intraparietal abscess communicating with the contracted bladder cavity, with several pelvic collections of purulent material and with a large crural pocket of pus, all probably caused by the primary purulent cystitis. Ureters and renal pelves were characteristically involved, and both kidneys were found completely degenerated.

A case of rare simulation is reported by Dumas,³⁴³ in a young and apparently healthy man who had been a hospital inmate for

some days under the diagnosis of cystitis. His urine contained blood, and over the bottom of the vessel there was a peculiar, thick, mucoid material. Suspecting malingering, Dumas soon had the satisfaction of confusing the patient to the extent of obtaining a confession of having put the blood from his gums into the bladder by means of a catheter which he had secreted, and the mucoid material was produced by putting starch in the chamber when unnoticed.

Treatment.—Besides operative measures for the removal of irritant bodies or the establishment of a urinary fistula for giving rest to the organ, a number of medicinal agents are variously recommended. The system of lavage with the use of a number of local remedies is urged by the majority of writers. In the method of employment Lavaux²¹_{Feb. 12} decries the use of the complicated catheter, the passage of which so often leads to an irritation more than overbalancing any good effects that might come from the washing of the bladder. He employs one of the ordinary French rectal irrigators, with a small rubber tube attached, which is passed only through the spongy portion of the urethra. The water or medicated solution is readily passed over the constricted membranous portion and into the bladder, thus avoiding the usual point of instrumental irritation. The tube leading to the instrument should be provided with a double cock, so as to shut off the ingress of water and allow that already thrown in to be withdrawn. The pressure of fluid injected should be carefully regulated, and dilatation of the bladder constantly avoided, although after repeated washings the capacity of the organ seems to be physiologically increased. The same general points are mentioned by other writers, as Bertholle,³⁵_{Aug. 30} Guyon,²⁶⁶_{Jan.} Emmerling,¹⁶¹_{Sept.} Schaeffer,²¹²_{June} and others. The usual character of the medicaments used for injections are of a germicidal or an emollient nature. Gaucher³_{Feb. 25} employs ordinary solutions of boric acid or borax; Lavaux uses a supersaturated solution of boracic acid (obtained by adding to one hundred parts boiling water fifteen parts of boracic acid and one part of calcined magnesia), which he regards of much greater therapeutic value than the ordinary solution of the acid. A considerable number of cases have been successfully treated by the use of solutions of nitrate of silver by Guyon, and also by Ferguson, of Manitoba, collaborator. Schilling³⁴_{Aug. 7} employs in the ordinary forms of fermenta-

tive cystitis injections of carbolic acid and chloroform water (5:1000.) As internal medications, associated with lavage, or employed aside from local measures, salol is reported of value by Arnold, of Stuttgart,¹¹⁶ July, and Burr, of the Eastern Michigan Asylum, Pontiac, collaborator; hippurate of lime is found of marked worth by Poulet²⁴ Oct. 21; arbutine by Cardoso¹²⁹ Nov.; pichi by a number of American physicians, as Mathis,²⁰² Sept. 10, Flagler,²⁰² Sept. 25, Randolph,²⁰² Aug. 10, Armstrong,²⁰² July 26, Garcin,⁸¹ Mar., Clemmisch,²⁰² Nov. 10, and Magill,²⁰² Nov. 25. Little, of Dublin,¹⁶ June, finds the internal employment of saccharine of service in preventing the vesical development of the strong ammoniacal odors sometimes met in cases of cystitis. Large doses of copaiba⁶⁰ Sept. 15 are commended in many of the stubborn cases of vesical catarrh, especially in those occurring in women past the menopause.

Epicystitis.—Fenwick⁶ Mar. 2 showed a case of bilharzial epicystitis in a patient aged twenty who had suffered from Cape hæmaturia for five years, and who came under observation in the autumn of 1887 with symptoms of perforation (extraperitoneal) of the bladder of nine days' duration. After severe exercise the patient suddenly passed large quantities of blood, and was seized with severe suprapubic pain. There was marked suprapubic dullness, not removed by catheterization, and the recto-vesical pouch was found filled with a soft mass the size of a foetal head. Under the impression that pericystitis had been set up by incomplete perforation of and leakage through the posterior wall, and as a result epicystitis and adhesion of the intestines, a suprapubic opening was made for drainage, but the prevesical space was found free. The retrovesical swelling gradually disappeared and the patient recovered. He still passed bilharzial ova. Electric illumination revealed multiple punctiform hæmorrhages at the base of the bladder.

CALCULI—VESICAL AND RENAL.

Sir Henry Thompson⁹ Feb. 18 urges that the term calculus be confined to the larger concretions—say above twenty grains (1.32 grammes). The French are in the habit of making some such division in their three terms, *gravelle*, *gravier*, and *calcul*, the first corresponding to the most minute of the crystalline collections, as in lithiasis, where the urine is sometimes passed containing crystalline particles of uric acid which at once settle to the bottom of the vase in the customary brick-dust sediment; the second to such concretions as

may be passed *per urethram*, and the last to such as from their size demand operative procedures.

Debout d'Estrées, collaborator,⁵⁹ calls attention to the relatively large proportion of cases of oxalic calculi in Americans and of uric acid in the Continentals, explaining the difference by the frequency of dyspepsia among the Americans and the habitual overfeeding among the Europeans. In the matter of diagnosis of renal calculi, Ralfe² points out the possibility of mistaking for this condition a simple neuralgia of the kidney or one arising from affection of some of the neighboring tissues, or reflected from a distance in the organism.

Miller, of Philadelphia,¹¹² demonstrated before the Pathological Society of that city the kidneys of a patient brought into the hospital in a moribund, comatose condition. Both organs were atrophied, devoid of normal structure, and cystic. In each cyst were found dark, blood-like masses, similar material being discovered in the pelves, made up of a nucleus of oxalate of lime, surrounded by fibrin in which were deposited rhombic crystals and sheaves of hæmoglobin, due probably to a slow, oozing hæmorrhage. Leblond,⁷ records an instance of the simultaneous presence of renal and biliary calculi in a case examined post-mortem by him. In speaking of the various phenomena and sequels of renal lithiasis, Lancereaux¹⁷ detailed a series of cases presenting a number of phases of the affection. He referred to several cases in which, after a varying number of hours of acute symptoms of renal obstruction, complete relief suddenly occurred, the sequence completed later on by the delivery, *per urethram*, of a small calculus. One case illustrated the pelvic situation of the calculus, associated with a consequent pyelitis and appearance of pus in the urine; and he mentions five cases (one of them analogous to Leblond's, above mentioned, from the co-existence of biliary calculi), in which the calculous disease was associated with, causatively or consequently, purulent degeneration of the organ.

Capon⁶ publishes the history of a young woman in whom there existed hereditary uric acid tendency, and in whom a sudden attack of renal colic was followed by complete anuria for five days, with grave concomitant symptoms. On post-mortem both kidneys were distended into huge hydronephrotic sacs, with none of the normal structure remaining. All the structures about the

right kidney were inflamed, the inflammation extending up to the diaphragm and invading the lung structure. The left ureter was plugged by a calculus of the size and shape of a rifle-ball, and the whole organ transformed into a series of sacs containing a clear yellow serum. The adhesions about the stone were evidently of long standing. The right kidney was also sacculated and disintegrated. The infundibula were dilated and contained one large and about one hundred and forty small calculi; and three stones blocked the ureter two inches below the pelvis. Southam²_{Mar. 24} exhibited to the Manchester Pathological Society the kidneys of a young woman aged twenty-three. The orifice of the right ureter was blocked by a small calculus and the whole gland converted into a multilocular cyst full of pus. The left kidney was not at all degenerated, but its pelvis was much dilated and contained five stones, three of large size, weighing over five ounces. Trent¹⁹_{Apr. 28} records a case of pyelitis of both kidneys, associated with a calculus in the right one, followed some weeks after discovery of the renal condition by a fatal purulent meningitis.

Morse⁷⁷_{Jan.} demonstrated two bladders—one much contracted and containing thirty-two faceted calculi, the other also contracted and containing a single calculus the size of a large hen's egg. Critzman⁷_{Jan.} reports a case of advanced tuberculosis of the genito-urinary apparatus in a man dead of general tuberculosis, in whose bladder was found a large mulberry calculus made up of oxalate of lime. Weiss, of Brünn,⁸⁴_{Mar. 21} demonstrated before the medical society of that town a urine showing large cystic crystals from a male twenty years old complaining of renal colic, and spoke of the likelihood of a vesical calculus developing from this material. Williams, of Norwich,⁵⁹_{Sept. 22} reports the records of a case of splenic leukæmia illustrating the rapidity of uric acid formation and the danger of calculi in this affection.

Treatment.—McLennan,⁸⁶_{Apr.} Edson,¹⁸⁶_{Oct.} and Vestal,¹⁹⁹_{Apr.} three American practitioners, report successful results in the solution of suspected calculi (uric acid) by means of hydrangea. Laird and Whaley¹⁰⁴_{Nov. 17} regard the Buffalo lithia springs of Virginia of high value in the solution of uric acid concretions, basing their belief upon observations upon calculi softened after use of this water to the extent that they could be crumbled in the hand. They state, moreover, that the uric acid crystals seen in the urine of cases employing this

agent have lost the usual sharp and well-defined edges, and that they have seen patients suffering from renal colic relieved under its use and presently pass large amounts of minute, sand-like concretions. A work of considerable value has been done by Posner and Goldenberg¹¹⁴ in reviewing and extending Pfeiffer's work upon the solubility of uric acid concretions. Following Pfeiffer, they employed the urine of persons to whom had been administered the mineral water or drug in question for several days, and passed a known quantity through a filter upon which was exposed to the solvent action of the solution a weighed amount of uric acid. Normal urine was found rather to add to the uric acid upon the filter than to remove any of it. Urine containing sodium bicarbonate, or the mineral waters of Vals or Vichy, were found to have an appreciable value in removing a portion of the uric acid upon the filter; after these the Fachingen waters, then a solution of Cantani's powder or carbonate of lithium alone. These agents, however, produce little or no effect upon large calculi, and these must be referred to surgical aid for removal. Debout d'Estrées,¹⁰⁰ of Contrexéville, concludes from observations since 1868, at Contrexéville, that spontaneous fracture of vesical calculi in most instances occurs when the calculi are small and of large number, and he does not regard the causes usually assigned as sufficient in the majority of instances.

VESICAL TUMORS.

Fenwick² brought before the London Pathological Society a very interesting series of statistics upon the subject of vesical epitheliomata from sixty cases from various museums. The male was found affected three times as often as the female; and this observation held good in a series referred to by the author of six hundred and thirty-four cases, embracing all varieties of vesical growth. Sixty per cent. of the specimens were single and 40 per cent. multiple; of the single, 43 per cent. were at the orifice of the right ureter and 26 per cent. at that of the left. Eighty-six per cent. of the single growths were at the inferior zone, originating at the margins of the trigone, pedunculated, or tending to become so in the proportion of two to one. In 80 per cent. of the multiple growths there were from three to twenty in the same bladder. They were rarely found in diverticula. There were

among the specimens a number showing that cancer might co-exist with benign growths (10 per cent.), and that vesical cancer might propagate itself by contact. Sir William Stokes⁶_{Nov. 31} communicated a case in which upon post-mortem section the appearances of vesical epithelioma, confirmed by microscopic examination, followed the removal of innocent papillomatous growths from the female bladder three years previously.

A case diagnosed as carcinoma of the bladder is recorded¹⁰²_{July} by Klippel. The tumor, on post-mortem section, about the size of a hickory-nut (two centimetres in diameter), firm and showing on cut surface a whitish, semi-cartilaginous appearance, occurred in a young woman aged twenty-seven years, with history of vesical calculous disease. The vesical disorder, attended by intense pain and difficult and painful micturition, existed for about twelve years before the death of the patient. There was considerable anæmia, pallor, and cachexia. The case is worthy of note because of the precedent calculous disease and the youth of the patient, although the circumstances of age and the long continuance of disease, with the firm character of the tumor, make the diagnosis questionable.

Lostalot¹¹⁸_{Oct.} records the occurrence of a small round-celled sarcoma at the neck of the bladder in the case of a child aged four years. A peculiarity which is occasionally noted in these growths in children, the absence of hæmaturia, was marked in this instance. An ascending purulent change had caused advanced degeneration in the kidneys of the patient.

Gelpke²¹⁴_{Feb. 11} publishes a case of chronic parametritis in a woman aged thirty years, resulting in a marked circumscribed purulent exudate which broke through the adjacent posterior bladder wall, and the irritation of the fistula thereby engendered at its mouth a large papillomatous growth, giving the usual symptoms of vesical tumor. An entire cure resulted from operative measures.

Thruston⁸⁵_{June} reports a case of perforating ulcer of the posterior vesical wall, with symptoms dating from time of death in 1887 to the apparently causative injury in 1883. The ulcer was circular in form, with ragged and gangrenous margin, the vesical diameter about four centimetres, that of the peritoneal surface about 2.5 centimetres. The ulcer had perforated all the coats except the peritoneal, which formed the floor of the ulcer. The walls of the bladder were concentrically hypertrophied, but the usual catarrhal

symptoms of cystitis were absent. From the intense pain and trouble of frequent micturition, the formation of a vesico-vaginal fistula gave marked relief. The author refers to similar cases in the experience of Rokitsansky, Tait, and Sir James Simpson.

DISEASES OF SUPRARENAL CAPSULES.

Physiology.—A work of some value in this direction has been carried on experimentally by Stilling⁸²_{June 10} who in fourteen experiments upon rabbits by removing entirely one of these organs, or by cutting off its blood supply, was able to produce within a few weeks a compensating hypertrophy of the remaining one. Recognizing the physiological variations in size of these organs in normal rabbits, the author kept control experiments on animals of about the same size and appearance as those used in the actual experiments, comparing the normal suprarenals with those from the subjects of his investigations. The results, microscopically and macroscopically, although meagre, point, on account of the rapidity and marked degree of hypertrophy in the remaining gland after removal of its fellow, to the rôle of these structures in the economy as one of importance. Tizzoni¹⁴_{Oct. 21} from a number of experiments upon rabbits, concludes that the suprarenal bodies play an important rôle in the distribution of pigment, that the removal, not only of both, but of but one, can modify the pigmentation of the skin and mucous membranes, and that, aside from this modification in pigmentation, rabbits from whom the adrenals have been removed may remain healthy and live for a long time. This author calls attention to the power of the suprarenals to sometimes reproduce themselves. Occasionally after removal of the adrenals in rabbits there may be noted a number of alterations in the central nervous system, more marked in the bulb, the cerebrum, and cerebellum than in the spinal cord, consisting for the most part of an infiltration of the pia mater by leucocytes, and a fibrinous exudation in the subarachnoid spaces. The white substance shows a destruction of the small round cells. All these changes occur especially along the course of the vessels.

A careful study of the functions of these bodies is presented by MacMunn,²_{Feb. 1} who points out from a stand-point of comparative anatomy the improbability of these structures being rudimentary in man, tracing their development from small, separate, paired or

multiple structures in the lower vertebrates to the complex organ in the higher, and referring the origin of each separate organ or portion of the fully developed adrenal to appropriate layers of the blastoderm, with the result of fixing a glandular character to these organs. The author points out that the increase in complexity and size in these organs corresponds with an increase in the respiratory pigments of the organism. It has already been shown that there are present in the medullary or glandular portion of the organ certain products of retrograde metamorphosis as well as chromogens, and the writer has found the spectroscopic bands of reduced hæmatin in these structures along with forms of incomplete metamorphosis of blood-pigment. These are found elsewhere in the organism in none but excretory glands, whence the author assigns an excretory function to these glands. Further, in a number of pathological cases where only the adrenals were involved, there was found a peculiar pigment known as urohæmato-porphyrin, a substance found only in conditions where there is such an excess of effete hæmoglobin that the blood-glands cannot remove it, or where a diseased condition of the blood-glands precludes their removing even the normal amount—this pointing, in the author's opinion, to the functions of the adrenals as those of blood-glands, removing from the circulation the worn-out coloring matters of the blood and their accompanying proteid bases. The former, retained, are deposited in the dermal tissues; the latter, possibly disintegrated and acting as septic agents, may cause the variations of temperature and the nervous symptoms seen in cases of involvement of the adrenals.

Cases of Involvement of the Suprarenals without Bronzing.—

During the past year a number of cases of clearly defined cheesy degeneration of the adrenals have been reported without the usual co-existent bronzing. Ballenghien²²⁰ details a case of tuberculous disease of the capsules without bronzing in a man aged twenty-six years, a mason, coughing three weeks, who entered the Charity Hospital in Paris in April, 1887, and died nearly two months later. At first he presented only the signs of a tubercular pleurisy with slight pneumonic involvement; late in the case persistent and uncontrollable vomiting set in, lasting almost to the close, when the patient fell into a semi-comatose condition, in which he died, after slight convulsions. Besides the tubercular adhesions at the apices,

the lower posterior portions of the pleuræ were thickly studded with tubercles; the lungs congested and showing granulation tubercles; heart showing general atrophy, no valvular lesions; peritoneum in right iliac fossa and right hypochondrium studded with tubercles. Both kidneys congested, smooth beneath the capsules, the left presenting two tubercular nodes in the parenchyma. Spleen large; perisplenitis; a number of tubercles on capsule. No meningeal involvement. Right adrenal almost double the size of the other; weight twenty grammes. On section found to be almost entirely cheesy. Left presenting the same lesions; weight, fifteen grammes. While in this instance there was absence of bronzing, the extremely rapid process of the tuberculosis may quite possibly have given too short a time for any pigmentary deposit. (There were several bluish spots upon the lips, noted after death, but not before.) Collier² showed before the London Pathological Society the right adrenal of a woman, aged thirty-six years, who had been ill for nine months with a gradual exhaustion and persistent vomiting. She was anæmic, in fair nourishment, and not bronzed. The most characteristic symptoms of the case were the apathy and languor. Both adrenals were found enlarged; the right entirely caseous, the left reduced to a sac containing cheesy material. The history and appearance of these organs point to the existence of the disease for at least nine or ten months—a circumstance making the absence of bronzing a more remarkable feature. Lejars⁷ publishes a case of marked tubercular enlargement and degeneration of both suprarenals, found in a dissecting-room subject, without any visible bronzing. The left adrenal weighed seventy grammes. It was enveloped in a fibrous covering two millimetres in thickness. It was rather firm in consistency and yellowish. The right adrenal weighed twenty grammes, and was much smaller than the left, made up of irregular nodules, cheesy, but less degenerated than the left. There were tubercular nodes in the parenchyma of the right kidney, some broken down. Fistulæ in the scrotum led to a partly degenerated left epididymis; the body of the testicle is healthy. Right testicle and epididymis both intact. The seminal vesicles, the vasa deferentia at their termination, and the lateral lobes of the prostate are softened and cheesy. On the left side Cooper's gland is transformed into a cheesy and purulent abscess

about the size of a hazel-nut. No visible extensions into the lungs—on the right there were a few pleuritic adhesions. Heart, pericardium, and other viscera all normal. Along the lumbar portion of the column is a chain of enlarged and cheesy lymphatic glands, reaching up as far as the level of the adrenals. The marked tubercular development in the adrenals without bronzing, and the manner of diffusion of the lesions and their possible mode of propagation (through the enlarged and cheesy lumbar lymphatics from the genital apparatus to the suprarenals), are of interest in this case.

Perry,²_{June} of the British Medical Service at Gibraltar, reports a case of enlargement of both suprarenals from sarcomatous involvement unattended by bronzing, showing, however, a muddy appearance of the skin, and accompanied by other symptoms of Addison's disease. The double involvement of the organs by a primary small-celled growth and the absence of pigmentation make the case unique. The right suprarenal weighed one-quarter of an ounce and the left one ounce, the structure firm, and the cut surface presented a number of yellowish nodules varying in size from a millet-seed to that of a small nut. Those of the left organ were larger, and in this there was a star-shaped opening on the anterior surface, apparently resulting from the breaking down of one of these nodules. Pilliet,⁷_{Nov.} reports a case of primary sarcoma of the right adrenal which had extended to the inferior vena cava, with subhepatic venous thrombosis and hæmorrhagic infarction of the liver. This tumor was of a cavernous nature and remarkable for its size. It was rounded, and measured twenty-five centimetres in the perpendicular and twenty centimetres in the horizontal axis. Its weight after section, clear of its fluids and hardened in alcohol, was two kilogrammes two hundred grammes. Microscopically it was made up of encephaloid patches, whitish, soft, and full of red and black hæmorrhagic foci, and varying in size from that of a nut to that of an egg. The author incidentally points out the value of the absence of persistent hæmaturia as a diagnostic point between such a case and sarcoma of the kidney itself.

Bradshaw¹⁸⁷_{July} refers to a case unattended by bronzing, in which the degenerative process in the suprarenals must have extended over a considerable period from the nature of the changes found

on post-mortem section. The case was not diagnosed in life. One of the capsules was found almost entirely replaced by a few nodules of chalk; the other was small, waxy on section, and showed no trace of its original structure. It contained a few small masses of granular material, apparently caseous, surrounded by dense fibrous capsules—the process, in the writer's opinion, one of chronic tubercular nature. Davidson¹⁶⁷ has reported a case in a man of forty-five years, occurring in 1883 in his practice in the Royal Infirmary at Liverpool, in which the prominent symptoms were exhaustion and emaciation. He had caught cold two months earlier and had since then failed rapidly, dying the day after admission. There was no bronzing. On section both adrenals were found much diseased and adherent to the neighboring tissues. The left was completely destroyed, cheesy, and calcareous; the right enlarged, firm, fibrous, with small calcareous deposits. No apparent change of the sympathetic nerves. Blackburn⁶¹ exhibited a sarcomatous suprarenal body before the Medical Society at Washington removed from a patient in the Government Hospital for the Insane. There was no pigmentation. The tumor involved the right adrenal, and on removal weighed ninety-seven and one-quarter ounces, and measured in its long axis eight and five-eighths inches, and its short axis five and seven-eighths inches. It was encapsulated, regular in contour, soft, and fluctuated slightly. The cut surface showed three concentrically arranged nodules, bulging slightly on the surface, and mottled and streaked with blood, apparently more recent in growth than the other parts of the tumor. The greater part of the tumor was brownish in color and very friable, the result of change. Microscopically the tumor was a sarcoma of the large, round-celled variety, with some tendency to reproduce the characteristics of the mother-tissue of the organ. Pilliet⁷ presented an adenoma of the right adrenal before the Anatomical Society of Paris, found after death in a patient dead from arterio-nephritis. The tumor was unsuspected, of the size of a hazel-nut, smooth, round, white, apparently continuous with the cortex. Microscopically it was composed of tubules like those of the adrenals in a matrix of connective tissue. These tubules were filled with goblet-cells having the arrangement of the cells of the adrenal tubules, and were all packed with fat-crystals, giving the white appearance to the tumor. The analogy

remarked by Virchow between these adenomata and those of the thyroid body was borne out by the existence in the thyroid of a beginning goitre; and in life, too, there was some degree of exophthalmia and palpitation.

Cases Showing Bronzing.—Plate ⁶⁶_{Nov. 15} and Davidson ¹⁸⁷_{Jan.} each demonstrated a case, bronzed, and presenting, as prominent symptoms, great debility, vomiting, and abdominal pain. A case of adrenal enlargement in a negro dead from exhaustion and slow heart failure showed at autopsy, conducted by Thacher, ¹_{Jan. 14}, a number of pigmented areas upon the tongue. A few tubercular deposits were present in different parts of the body. Vaquez ⁷_{Nov. 20} reports a case occurring in a patient, aged forty-one years, of evident tubercular diathesis, presenting the usual symptoms. The actual illness extended over six months. The tubercular change was notably localized in the adrenals, both being enlarged, the right weighing thirty-five grammes, the left thirty, and on section both present broken, cheesy, and softened areas traversed by fibrous bands of varying size—cortex but little involved. No tubercular bacilli were found. The author credits Toupet with having demonstrated bacilli in a recent case. A case of Addison's disease in an insane patient, aged forty years, with marked loss of strength, bronzing, and nervous symptoms is reported ¹⁸⁶_{Apr.} by Boggess. The adrenals were enlarged, and on section appeared fibrous, with cheesy nodules scattered throughout. No bacilli were found. Tubercular lesions were found in the pancreas and right testicle. An analogous case is reported by Kirby ²_{Nov. 17}, in a young woman, ill for about four months. Both adrenals were broken down with suppurative changes; the prominent symptoms were delusions, headache, constipation, enlarged spleen, and, for the last two months of life, marked bronzing. Bar ⁴⁶_{Oct. 20} removed the adrenals from a bronzed case, dying forty-eight hours after admission to the hospital, in a comatose condition. The right weighed twenty-two grammes (fifty centigrammes); the left forty-eight grammes. Both presented a pulpy, grayish-red, uniform appearance upon section. Jürgens ⁴¹_{May 10} pointed out before the Medical Society of Berlin that in a large proportion of cases of Addison's disease there exists a gray degeneration of the splanchnics, no matter whether disease of the adrenals precedes or not, and presented a case showing, along with such degeneration, a co-existing condition of tabes. Bradshaw ¹⁸⁷_{July} demon-

strated the minute changes in the adrenals and semilunar ganglia in a case developing during the course of dorsal caries. Tubercles were found also in the retroperitoneal glands. The large ganglion cells were atrophied and in a state of pigmentary infiltration, and the great splanchnic showed cellular infiltration in the perineurium.

Von Kahlden²⁰ describes two cases, in one both adrenals being caseous, in the other only the right one. In both cases tubercle bacilli were found. These cases in the same manner as those above point toward semilunar ganglionic involvement as influencing the production of the symptoms of Addison's disease. In the first case the left ganglion showed atrophy and pigmentation of the large nervous cells, a peculiar hyaline degeneration and thickening of the walls of the vessels, and a round-celled infiltration into the adventitia; the nerves entering the ganglion presented only thickening of the perineurium. The right ganglion presented the same changes, but not the hyaline degeneration and cellular infiltration of the vessel walls. In the second case von Kahlden observed in the right ganglion (corresponding to the diseased capsule) thickening of the cell-capsules, a number of hæmorrhages into the periphery, occlusion of the vessels, and thickening of their walls by connective tissue; and in the left ganglion but little beyond a number of recent peripheral hæmorrhages and some thickening about the ganglion cells. In regard to the pigmentary deposits, the author shows that the coloring matter is deposited in the deeper layers of the skin, and is carried into the epithelial cells by wandering white blood-corpuscles. The origin of the pigmentary material von Kahlden regards as undoubtedly in the blood, but does not believe, from his observations, that any disease or rupture of the vessels plays any rôle in the process.

Kailas Chundra Bose²⁰⁶ publishes observations in about thirty cases observed in his Indian practice, diagnosed as diseased suprarenal capsules but not verified by post-mortem section on account of the customs of the country. The majority of these cases were from the northwestern provinces, and the bulk of the cases fell among the middle class. The most of the subjects were of active habits, living in unhygienic conditions, upon insufficient and wretched food, usually given to long hours of work and short periods of repose. As symptomatic the writer mentions hæmatic disturbances, as evidenced by *bruits* heard over the base of the heart

and in the vessels of the neck ; vomiting ; loss of sexual excitement ; marked pigmentation, especially about the eyes, flexures, palms and soles ; occasionally slight nervous disturbances ; great weakness, and a duration of from four to six months.

An interesting case of the complication of Addison's disease with exophthalmic goitre (*vide supra*) is published by Oppenheim,⁴¹ presenting symptoms of the types usual to each of these conditions. The case is noteworthy as illustrative of sympathetic involvement in two of its centres, the cervical and abdominal.

The above cases of adrenal involvement without co-existing pigmentary changes lends considerable weight to the assertions of those pathologists who find Addison's disease rather a disease of nervous origin than one involving a glandular organ. This opinion is further strengthened by the finding of pigmentary changes in cases presenting no demonstrable change in the adrenals. Another point of no slight weight may be taken in the suggestion of Jürgens, that at least a certain class of pigmented instances are due to peripheral nervous irritation, possibly from epithelial degeneration or actual external irritation, mostly met about the flexures, folds, and in the face, from exposure. This last suggestion is further borne out physiologically from the pigmentation often caused by the constant wearing of even non-metallic objects, as buttons, next the skin.

The opposite view, *i.e.*, of glandular destruction, cannot, however, be set aside, numerous careful observations and the results of various experimenters offering weight in this direction.

As to the nature of growth found in the suprarenals, there can be but little doubt that other new formations than tuberculosis are attended by the complex of symptoms of Addison's disease.

As to the real microscopic nature and mode of growth of such tumors which, as, for example, Blackburn's or Pilliet's, show a special tendency toward a reproduction of the mother-tissue of the gland, there must remain the usual question. Whether the reproductive efforts, so-called, are not in reality only portions of the previous tissue which has been involved, but not destroyed, is doubtful, unless, of course, we accept as established that all such tumors are of an adenomatous nature, and that an adenoma of one organ must differ from that of another organ in the same manner as do the organs themselves. These peculiar examples of an

influence rarely accounted of potency in the study of cellular pathology indicate a factor in their growth as yet, in spite of the considerable attention attracted to them, undecided.

In the treatment of any form of adrenal involvement, no special progress has been attained within the past year, and only general rules are to be followed. Where there is undoubted tubercular invasion, of course, operative measures are to be withheld; but in well-defined unilateral involvement, as from tumor formation, the removal of the diseased body should be gravely considered.

FEVERS.

By J. C. WILSON, M.D.,

ASSISTED BY

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THE journal contributions on this subject during the year have been numerous and important. The admirable papers by MacAlister, Austin Flint, H. C. Wood, and others, referred to in the ANNUAL for last year, excited very general renewed interest among pathologists in the mechanism of fevers; the recognition of the part played by ptomaines in the causation of fever has also given a new impetus to the scientific study of the febrile infectious diseases. The prevalence of local epidemics of enteric fever in France has led to important and fruitful investigations into the rôle of the water supply in the causation of this disease and to active discussion of its treatment; while, finally, the epidemic of yellow fever, which, having showed itself at Tampa, in 1887, broke out extensively and disastrously at Jacksonville and elsewhere in Florida during the past summer, has turned the attention of physicians to the investigation of the causes and treatment of this disease. To these influences must be largely attributed the remarkable activity shown by the profession in this department of clinical medicine during the past year. Much of the work is chiefly of historical interest, as embodying records of facts observed on a more or less extensive scale. A considerable part of it is of value as setting forth new views and supplying confirmatory evidence of the correctness of the results of recent observations, and it is creditable to the profession that a small proportion of it only has been poured into traditional molds of imperfect observation and conjecture.

General Pathology of Fever.—The neurotic theory of fever is the prevailing doctrine. Almost without exception, authors look upon disturbance of heat regulation as the initial step in the pathological process. The cause of this disturbance may be an impression,

direct or reflex, upon nerve-centres, or a morbid agent circulating in the blood, produced within the organism itself, or introduced from without. Animal alkaloids, whether putrefactive (that is, results of the life activity of microbes) or the result of normal or abnormal metabolism, and non-alkaloidal ferments normally present in the economy or arising from perversion of normal processes, are the principal intrinsic pyrogenic agents. Ptomaines may also be introduced with food, but of extrinsic agents, micro-organisms, whether directly pathogenic, or giving rise to chemical changes which produce the pathogenic agent, are still considered the most important. On the one hand, the fact of increased oxidation of tissues not to be accounted for merely by elevation of temperature, and on the other hand the connection between simple pyrexia and respiratory and circulatory disturbances, seem to have been confirmed by more or less carefully conducted experiments. Researches into the alterations of tissues and fluids show that fatty degeneration of muscular tissue may be produced by heat, though not to the extent formerly supposed; while evidence as to the structural changes in non-muscular organs is conflicting, both as to nature and causation. The state of the blood seems to vary in different diseases, hence presumably with the nature of the pathogenic agent. The difference between thermometry and calorimetry is more and more emphasized, and conclusions drawn from temperature curves become consequently more and more guarded. Finally, the Hippocratic doctrine that fever is a protective effort of the organism against its enemies is more or less positively advocated by many writers in various terminology.

Welch,⁹⁹_{Apr. 5, 18, 20} in a careful and critical review of all the evidence, recognizes fever as a complex process, though he would prefer to limit the term to elevation of temperature. There is both increased heat production and increased heat loss. The temperature at any time, depending on the ratio between these processes, fails to indicate the actual energy of either. In the early stages, production predominates; in defervescence, loss prevails, and in crisis may be threefold the normal amount. Fluctuations, specially irregular in heat loss, qualify the value of a general statement. Augmented oxidation is an essential part of the febrile process, indicating increased heat production, and is not merely the result of elevated temperature. No great importance can be attached to the persist-

ence as heat of energy normally applied to work (Ord's hypothesis). Recognizing in muscles and glands the principal sources of body heat, all thermogenic phenomena may be found, as pointed out by MacAlister, to depend upon the action of katabolic (thermo-excitatory) and anabolic (thermo-inhibitory) nerves. The symptoms of fever point to disturbances of both sets. No definite conclusions can be drawn from experiments upon nervous centres except that injury of a circumscribed definite region of the brain may excite fever independently of the presence of pyrogenic agents in the blood. Welch punctured the caudate nucleus in rabbits; determining, in addition to confirmation of the results of previous observers, that the power of heat regulation is lessened. He sees no reason why the condition should not be called fever. This experimental evidence of the possibility of a purely neurotic origin of fever is confirmed by the clinical cases collected by White.⁴²⁸₁₈₉₄ To determine the relation between increased temperature and the various disorders of bodily function, and in how far high temperature in itself, independently of infection and other disturbing elements, is dangerous to life, Welch conducted a series of experiments upon rabbits, in a large heating-box, constructed to afford ventilation and other favorable conditions. Having succeeded in keeping alive for three weeks two large black rabbits with an average rectal temperature of 107.3° F. (41.8° C.) and 106.6° F. (41.4° C.) respectively, he concludes, with some reserve in the application of his results to man, that human beings may tolerate temperatures of 107° F. (41.7° C.), or even higher, for a considerable time. This inference is supported by clinical observations, especially in relapsing fever. He notes, too, the occurrence of a critical temperature, about 108°–109° F. (42.2–42.8° C.) in his experiments, at which sudden and fatal further elevation occurs, apparently from paralysis of heat regulation.

Hyperpyrexia in human beings may doubtless be susceptible of similar explanation. Different animals, moreover, differ in their power of tolerating temperature, and the normal resistance of any individual may be weakened by various causes. Infection may thus lower resistance; and while in some cases a moderate or even a great elevation of temperature may be comparatively harmless, in others the system may be placed in such a condition by other factors—infection, for example—that high temperature under

these circumstances becomes a source of danger. With these restrictions, Welch asserts that febrile temperatures do not in themselves exert the injurious influences usually attributed to them. The only functional disturbances directly attributable to high temperature are increased frequency of pulse and respiration. The rapid respiration is due partly to reflex stimulation from peripheral effect upon the skin, partly to action of warmed blood upon the respiratory centres. The quickened pulse is shown by experiments of Martin to be due to the effect of the heated blood upon the heart itself. While prolonged high temperature will produce fatty degeneration of the heart (as of other organs), yet other factors are concerned in this lesion, and it may exist without serious impairment of cardiac function. Increased consumption of tissue is but partially due to high temperature. Lessened perspiration, renal and digestive disorders are likewise referred largely to other factors, while intoxication rather than high temperature is looked upon as the cause of sensorial disturbances.

Three groups of pyrogenetic agents are described. The first consists of certain substances which have no necessary connection with micro-organisms, and which are either not foreign to the organism or are readily formed within it by unorganized ferments. Ferment intoxications and aseptic traumatic fevers are instances of fevers produced by this class of agencies. The second group includes substances that result from putrefactive decomposition brought about in the body itself or in food substances taken into the body by the action of bacteria not in themselves pathogenic. The third and most important group of fever-producing agents is formed by the pathogenic micro-organisms. In some cases we have evidence that these likewise act by producing poisonous substances within the body. We are not warranted, however, in concluding that such is their only method of action. It is possible that the three groups of substances described may act mediately to produce within the body one and the same active agent. Independently of these causes, heat exposure may give rise to a special form of thermic fever. Tetanus is due in some cases to a bacillus, in other cases the cause of the disease and its fever are undetermined. Purely nervous fever or neurotic pyrexia may exist in organic disease and in hysteria, or as a reflex neurosis, as in some cases of catheter fever. The doctrine of evolution

indicates a protective tendency in a process which characterizes the reaction of all warm-blooded animals against the invasion of an enemy, and we are justified in believing that fever-producing agents light the fire which consumes them. It is not inconsistent with this view that the fire may require the controlling hand of the physician to prevent injury to the patient.

Vincent¹⁸⁸ reports the results of more than thirty experiments upon animals subjected to overheating, either by exposure to the sun or in a heating-box. His apparatus was carefully constructed to avoid all sources of error in the experiments or in their automatic records. Warm-blooded animals, such as dogs, died when their temperature reached 45° C. (113° F.); death occurred three or four hours after the temperature of the heating-box reached 37° to 38° C. (98.6° to 100.4° F.).

Rabbits exposed to the sun (34° C., 93.2° F.) died in about one and a half hours at the same average temperature, 45° C. (113° F.). The temperature may remain stationary at first, or even be depressed during the first half hour, after which it rises gradually and regularly until within the last half hour before death, when the increase becomes more rapid. In one case the rise continued *post-mortem*. Agitation, cries, and moans accompany the rise of temperature. At 41° or 42° C. (105.8° to 107.6° F.) the distress becomes extreme; a little later it ceases, and little by little the animal falls into coma more or less profound, interrupted by violent convulsions, general tetanic spasms, trismus, or at times clonism. The hyperæsthesia of the period of agitation gives place to complete anæsthesia. Reflexes in general are abolished, but the pupil reflex is manifested more or less, save in the last moments of life. The corneal reflex is the most constant. Microscopic examination of the sciatic, tibial, phrenic, and pneumogastric nerves showed no lesion, permitting the cause of the phenomena to be ascribed to the nervous centres. Interesting plates illustrating respiratory disturbances are given. The frequency of respiration is regularly but rapidly accelerated with the increase of temperature, reaching successively one hundred, two hundred, two hundred and fifty, and two hundred and ninety inspirations in the minute (*thermic polypnœa* of Richet). In one case it reached six hundred. Having attained its maximum, the rate of respiration declines gradually from forty to thirty inspirations

per minute before it is arrested. The animal dies in expiration. Amplitude is in the inverse ratio to frequency; but at times there is prolonged arrest—veritable respiratory syncope—which may last for thirty to fifty seconds. Restoration occurs gradually. Cardiac syncope may take place simultaneously. After this period of apnœa a new respiratory type is developed, tending at last to become feeble, slow, and labored, but a very small quantity of air entering the lungs. Various abnormal types of respiration are described and illustrated, showing a true respiratory ataxia, *i. e.*, a defect of co-ordination in the centres manifested by excitement of function followed by failure. In connection with the phenomena of general excitement, followed by depression and coma, we are forced to the conclusion that there exists disorder of the cerebro-spinal nervous centres, especially the medulla. Observations upon the absorption of oxygen show that it augments with the temperature, whether this be suddenly or gradually increased, diminishing somewhat in the period immediately preceding death. Disregarding details, the same animal in a normal state absorbed one litre of oxygen in five minutes thirty seconds; and, exposed to heat, absorbed one litre of oxygen in three minutes and four seconds, or at a rate nearly double the normal. The rate of cardiac pulsation rises gradually with the temperature, but without attaining any remarkable elevation. With temperature of 42.2° C. (108° F.) and respiration of one hundred and eighty the pulse-rate would not be greater than eighty-four. The maxima of pulse and respiration curves do not correspond. When the latter is at its fastigium the pulse oscillates between one hundred and thirty and one hundred and forty. In the last half hour before death sudden and rapid increase of pulse occurs, reaching a rate of two hundred and thirty to three hundred or more. A rate of from one hundred and twelve to one hundred and fifty-two is maintained up to one minute before death. Respiration ceases twenty seconds to two minutes before the heart is arrested in systole. Arterial pressure is not diminished until the animal is in death throes. Just before death, when the non-oxygenated and highly carbonized blood excites the medulla, the blood pressure, though greatly diminished, rises two or three centimetres, but descends rapidly to zero. General vascular dilatation is ascribed to paralysis of vaso-constrictors, and is believed to explain the fact that the temperature of the animal

becomes so much greater than that of the heating-box—an explanation the editor of this department cannot accept, in view of our present knowledge of heat regulation.

Microscopic examination of the blood showed only slight crenation of red cells in animals which died in the heating-box—those exposed to the sun did not show even this. The disorganization of globules and transudation of plasma described by Litten was not found. The number of blood-cells appeared to be increased, but this was entirely relative, due to concentration of plasma from the great evaporation from the pulmonary surface and the skin. For the same reason an apparent increase in hæmoglobin was noted. No alteration in the gaseous constituents of the blood could be satisfactorily demonstrated. Certain toxic principles were found by physiological reaction to have been developed in the blood, some having a narcotic action, others giving rise to convulsions, still others possessing mydriatic properties. Autointoxication with these substances (leucomaines and decomposition products) is favored by the anuria which results from high temperature. Coma and failure of the medullary functions, and, indeed, all other morbid phenomena of hyperpyrexia are believed to be explicable by the action of these toxic agents, themselves the result of heat.

Anderson²⁸⁴_{Sept} rejects micro-organisms as a cause of disease, on the ground that disease must exist before the micro-organism can do harm. Referring to Benjamin Ward Richardson's observations of twenty years ago, he considers that "fever, like pain, is an outward expression of internal derangement," caused by "improper food or drink, sudden changes of temperature, exposure to dampness or cold, overpowering heat, atmospheric changes, specific ptomaines, whether imbibed, inhaled, or generated in the system." Many diseases ordinarily mild may by improper treatment or neglect become malignant and infectious through the development of ptomaines.

Maragliano¹¹⁴_{M. 14, H. 4} has studied the behavior of blood-vessels in fever and in antipyresis. He distinguishes between Traube's and Marey's theories of vaso-constriction in fever, on the ground that in the former this is the primary and important phenomenon, while in the latter it is regarded as secondary to an initial dilatation. By the aid of Mosso's water-plethysmograph, it was determined that

vaso-constriction precedes elevation of temperature; that as the constriction progresses the temperature rises; that the temperature and constriction reach their maxima together; that temperature begins to fall before there is any dilatation of the vessels; and that fall of temperature and vaso-dilatation then progress together, reaching normal at the same time. Chill ensues when the constriction of vessels becomes marked and continuous. Antipyretic measures lower temperature in so far as they cause vaso-dilatation, and when their antifebrile power is exhausted, and the temperature rise recurs, this new invasion is always preceded by vaso-constriction.

Chelchowski⁵²⁰_{7.8.10}¹⁸ considers slowing of the pulse in convalescence from acute fevers to be due to degeneration of the striated muscular fibres, throwing certain chemical products into the blood, which affect the heart. It is of good prognostic import.

Wolff²⁰_{Apr. 3} has instituted a series of careful experiments on the inheritance of infectious diseases. Each disease must be studied independently. So far as his present observations go, he concludes that the placenta forms an insuperable barrier to the passage of anthrax bacilli from mother to foetus, and the vaccine virus in a similar manner is shut out from the foetus by the placenta. While clinical observations show that variola may be communicated from mother to foetus, yet this is rather by reason of hæmorrhages in the genitalia causing direct infection from the maternal blood, and not by transmission through the placenta.

Buchner⁵⁷_{Aug. 12} caused animals to inhale fine sprays containing spores and bacilli of anthrax, chicken-cholera, rabbit-septicæmia, hog-erysipelas, and glanders. Ninety-six out of one hundred and forty animals acquired the respective diseases in from two to four days. The microbes of anthrax, rabbit-septicæmia, hog-erysipelas, and chicken-cholera entered the blood directly through the alveolar walls and pulmonary capillaries, not through bronchial glands and lymph channels. Spores of anthrax reached the blood more readily than bacilli, as the latter, being more irritating, quickly set up a general inflammation of lung-tissues. Serofibrinous hæmorrhagic pneumonia is the result, the alveoli being filled with exudate, in which masses of the rods and threads are imbedded. The local affection is severe, but general infection remarkably lessened. The bacilli of tubercle and of glanders, however, are not blood-

parasites, and set up local disease only, followed by infection of other viscera.

Qucirolo¹⁴ injected the sweat of patients affected with various infectious fevers into animals, which died in from twelve to eighteen hours, but without elevation of temperature, nor at the autopsies were the ordinary signs of infection discovered. He concludes that the sweat contains toxic matters, and that diaphoresis should be favored in treatment by all means possible.

Wiley⁶ considers that the cause of death in malignant fevers is paralysis, more or less sudden, of the vasomotor system, producing collapse of blood pressure throughout the body, and thus giving rise first to syncope, then to death from asphyxia, the same phenomena as result from experimental division of the splanchnics.

Monot¹¹⁸⁸ finds an increase of leucocytes in all acute and chronic febrile affections, the number varying not only proportionately to the temperature but parallel with its course. He looks upon fever as a condition of leucocytosis, heat directly stimulating the activity of their reproduction.

Stöcker^{740 54}_{v.12,p.310; Feb.16} has investigated the changes produced in the marrow of bones by acute febrile diseases in animals. He finds arterial and venous hyperæmia, hæmorrhagic infarction, metaplasia (*i. e.*, change of yellow into red or lymphoid marrow), and hyperplasia. These changes are due in part to chemical action, in part to the mechanical effect of organized or unorganized foreign bodies in the blood-stream. In addition to this, in several instances, similar affections of the synovial membrane of neighboring joints was found. Nine cases are related, including pleuropneumonia, colic, septicæmia, tetanus, and lumbago gravis.

Tumas³²⁶_{Id.41,H.46} has examined the blood in twenty cases of typhoid fever, one of spotted typhus, and nine of croupous pneumonia. Under the influence of septic fever the number of red corpuscles and the proportion of hæmoglobin suffer absolute diminution. It is true that in the beginning of typhoid fever, for example, there is an apparent increase of the red globules as well as of hæmoglobin; but this is relative only, the blood being deficient in water. In croupous pneumonia of fevers of short duration, the diminution of red globules is less prolonged than in typhoid. In the latter, too, the hæmoglobin curve is lower than that of the blood-cells,

showing that the proportion of hæmoglobin is relatively diminished to the number of red globules. This is explained by the longer duration of the malady as compared, for example, with croupous pneumonia. Tumas believes that he has proved the error of Böckmann's theory, that the proportion of red cells varies inversely, and that of white cells directly, as the intensity of the fever. On the contrary, fever determines in general an absolute as well as a relative decrease of white cells, while during the non-febrile period the number is normal or slightly augmented. In pneumonia, however, the conditions are reversed. The author offers no explanation of the fact.

McLaughlin ²²_{Mar. 21} considers hyperpyrexia dependent on deficient correlations between production and loss of heat due to derangement of the nervous system by impressions from without, by the condition of the blood, or by disease of its own substance. Typhoid symptoms are referred to accumulation of waste products in the blood. He relates the case of a child of four years, in whom fever, with a temperature of 106° F. (41.11° C.), was clearly attributable to fright; also that of a strong, healthy man, aged fifty, who, after a fall injuring ribs, right lung, and possibly liver, progressed favorably for a week, and then suddenly, without chill, developed a temperature of one hundred and seven degrees. McLaughlin excludes inflammation of lungs or liver, contraction of cutaneous blood-vessels, or disease of spinal cord, and concludes that as there were no head symptoms previous to the rise of temperature, the cause of the mischief was located somewhere in the nerves of chest or abdomen, probably in sympathetic ganglia near the heads of the ribs injured at the time of the accident.

Gamaleia ²⁰²_{Nov. 1} ³⁴_{Aug. 20} considers that in splenic fever and pneumonia it has been demonstrated that neither the infectious micro-organisms nor their ptomaines can be looked upon as a cause of fever. After injection of virulent anthrax bacteria, causing speedy death, fever may be altogether absent, in which case, too, there will be no splenic tumor. On the contrary, injection of attenuated bacteria causes, as a rule, fever of several days' duration, with marked hyperæmia and enlargement of the spleen. Further, according to Hoffa, the isolated alkaloid of anthrax bacteria in non-lethal doses does not cause fever, but only somnolence and coma, associated with minimal elevation of temperature. If, then, fever is not a direct

effect of bacteria or of their products, it must be a reaction of the organism against their invasion. The hyperæmia of kidneys, liver, bone-marrow, and spleen in animals dying with fever after inoculation with anthrax is considered a proof of this position. Microscopic examination shows that during the fever an active warfare is conducted against the bacteria, which show, especially in the spleen and bone-marrow, numerous evidences of degenerative change, most marked in the interior of the so-called makrophagi of Met-schnikoff, cells of the spleen-pulp which exhibit large round nuclei. The author found the same condition after injection of various pathogenic and non-pathogenic bacteria, which, during the fastigium of fever, were found inclosed in the makrophagi, either still living or already deprived of activity. He concludes that the pathological manifestation of fever in infectious diseases must be considered as the sum total of the alterations in the activity of circulatory and glandular systems by which the destruction and expulsion of bacteria are accomplished. From this point of view the administration of antipyretics, which do not combat the bacteria, but the fever that should destroy them, must appear to be of doubtful wisdom.

Bornemann⁵⁰⁵ ²⁸⁸_{No. 67, Oct. 7} relates an instance of peculiar disturbance of temperature during convalescence from scarlatina in a child aged eight years. The normal temperature was normal or subnormal (36.2° C., 96.8° F.), while the evening temperature would reach 38.5° to 39.4° C. (101° to 103° F.). Antifebrin produced a suspension of the disturbance, which reappeared on the withdrawal of the drug. Recovery finally took place under the influence of this medicament. The author believes the symptoms to have been caused by an affection of the heat-regulating centres analogous to that which occurs in muscles after typhoid fever and in the nerves after diphtheria.

De Ruyter⁵⁰⁶ ²⁸⁹_{Apr. 15} found on spectroscopic examination of the blood of living animals infected with anthrax, glanders, and tuberculosis no alteration. Blood infected with the virus of malignant œdema and allowed to decompose showed a spectrum line having certain points of coincidence with that of metahæmoglobin. This line could also be demonstrated in many forms of sepsis, on reducing the blood with ammonium sulphide. Other observations on the blood of human beings suffering with septic diphtheria gave similar results.

Further investigations will be undertaken to determine whether this indicates an alteration of oxyhæmoglobin by the action of ptomaines.

Ott,⁵⁰_{Sept. 22} in a paper before the American Physiological Society, related observations upon eight animals in whom putrid blood was injected subcutaneously and by the jugular vein. Five showed increased production of heat, three diminished heat production. Heat dissipation was increased in four and diminished in four. He attributes fever to derangement of the harmony of thermogenesis, thermolysis, and thermotaxis, by an agent developed within or entering from without. Its result is increased metabolism. The four basal centres play the most important part in the production of fever.

GENERAL CONSIDERATIONS ON THE TREATMENT OF FEVER.

Liebermeister,⁶⁰ discusses the treatment of fever under the following general propositions: (1) in many cases of febrile disease the height of the temperature constitutes a danger; (2) in such cases the therapeutic problem is to reduce the temperature; (3) the basis of the antipyretic treatment is the direct withdrawal of heat by means of cooling baths; (4) in many cases the administration of antipyretic medicaments is at the same time necessary. He concludes his paper with the expression of the hope that he will live to see the time when, as a result of experience, the profession will become very generally adherents of the antipyretic treatment.

Arkle,²²_{Mar. 26} reports a case of hyperpyrexia and rheumatism in a man, aged twenty-seven, in whom the temperature reached 110.4° F. (43.6° C.), successfully treated by cold. After forty minutes in an ice-cold bath, the temperature fell to 97° F. (36.11° C.), but ran up four hours later to 107.2° F. (42° C.), notwithstanding the administration of antifebrin. The bath was repeated for twenty-five minutes, the temperature fell again, and showed no further tendency to run up excessively. No visceral lesion. Patient discharged cured. The author reports a second case, that of a woman, likewise suffering from rheumatism, in whom the temperature suddenly ran up to 110.4° F. (43.33° C.). This rise was associated with violent delirium. Patient was treated with ice-cold packs. Temperature fell in an hour to 101° F. (38.33° C.). Likewise discharged cured.

Carslaw²¹³_{Apr.} concludes from a series of clinical studies that though phenacetin has antipyretic properties, it is uncertain in its effects and by no means free from danger; and further, that, comparing it with other antipyretic remedies, such as quinine, salicylate of soda, antipyrin, and antifebrin, already familiar in hospital practice, it is not at all entitled to the prominent position which has been assigned to it.

Grenfell¹⁵_{v.1, p.344} reports a series of cases, with temperature charts, in which phenacetin was employed as an antipyretic. He demonstrated that its action in this direction is positive. The temperature begins to fall within half an hour after the administration. The patient generally perspires freely and feels drowsy. Sleep often follows and pain is relieved, while the patient always says that he feels more comfortable after the administration of the medicine. The most satisfactory dose for an adult is about eight grains (0.52 gramme). Children bear the drug well.

Vernon⁸⁰_{June 18} holds the opinion that in the treatment of serious febrile affections, as well as for the prevention or jugulation of pyrexia, slight purgation plays a most important rôle. Without the important co-operation of this form of treatment, antiseptics and antipyrexia could have no existence.

Barnett⁶¹_{Sept. 29} regards the salicylate of ammonium as among the more efficient of the antipyretics. In all fevers characterized by extreme adynamia it may be safely used, owing to its ammonium base. It is stimulant as well as antipyretic, and thus fulfills indications only met by a combination of remedies. It is an agent of wide germicidal powers, being promptly efficient in affections differing widely in their etiology and pathology. As a remedial agent in typhoid and remittent fevers it is unsurpassed, aborting them at the outset under favorable conditions, and gradually mitigating their severity and danger under circumstances less favorable. The author's opinions have been corroborated by Sullivan, Fliesburg, Wick, Sauerherring, and others. Further investigations are needed.

TYPHOID (ENTERIC) FEVER.

Etiology.—Péter¹⁰⁰_{Nov. 21} states that twenty-five years ago he saw an examiner, a pupil of Andral, pluck a student for having said that typhoid fever might be contagious. But the times have

changed, and a student who said the contrary would now be rejected. The physicians of the present may be divided into three groups: those who believe in the spontaneous origin of the infecting principle of enteric fever, those who believe in its contagiousness, and those who hold to both these views. Péter declares himself to belong to the last. The contagionists may be subdivided into those who believe only in contamination by typhoid material and those who think that contamination may arise from any kind of fæcal material whatever. Péter inclines to the latter view.

Picot⁷⁰_{Nov. 51, 52, 57, 1, 4, 7, 10} made use of the opportunity afforded by the recent epidemic at Bordeaux to deliver a series of lectures upon enteric fever. This epidemic arose in the last week of November, 1887, and prevailed extensively for some months; it was due to contamination of the water supply. He reviewed in an admirable manner the present state of science in regard to the nature of the disease, and particularly in regard to the researches, which have clearly established its bacterial origin. The concluding lectures of the course point out the direct application of this knowledge to prophylaxis and therapeutics.

Mosny¹⁴⁶_{Feb.} called attention to the remarkable diminution in the prevalence of enteric fever in Vienna, and expressed the opinion that the change in the water supply has been the cause of this fortunate change. Since 1874, the city, formerly only supplied by water from wells or from the Danube, has derived its water from the sources of the Kaiserbrunnen and the Stixenstein, which give each day about one hundred and seventy litres per capita. The death-rate of typhoid fever, which had in 1859 already considerably diminished to 1.2 per thousand in place of two per thousand, a result of the consideration of sewers, fell in 1874 to 0.11 per thousand, as a result of the distribution of spring-water. Many houses were still at this time supplied with well-water. In these houses the proportion was 3.02 per hundred, while in those supplied with spring-water it was only 1.26 per hundred. (I presume that these latter figures refer to the prevalence of the disease, and not to its mortality.)

A final and conclusive proof is furnished by the epidemic in 1877, which followed the partial substitution of the waters of the Danube for spring-water in certain quarters. The epidemic was

localized in the districts provided with the Danube water. The number of patients in this quarter was 21.5, while in those provided with the water from the springs it was 3.8. From this it is to be concluded that water is a principal agent for the transmission of typhoid fever, and that in order to protect the city it is necessary to supply the population with a sufficient quantity of water of incontestable quality.

Roux²⁴³_{Mar.} found the presence of typhoid fever at the garrison of Angoulême, which had only been free from the disease one month in ten years, namely, November, 1884, and which periodically has broken out in frightful epidemics, to be due to pollution of the drinking-water. Pouchet¹⁴⁶_{Feb.} analyzed the water supply of a group of houses at Joigny, in which typhoid fever had prevailed in the form of an epidemic, described by Longbois. He found the waters much defiled with organic refuse. Culture experiments showed a variety of bacteria, but no bacillus typhosus. Martin¹⁸⁸_{Feb. 6} showed incontestably that the epidemic at Bordeaux in 1887 was due to the contamination of one of the sources of the water supply. He demanded, as a measure of prudence, that the water derived from the district referred to be no longer distributed. This having been carried into effect, there was a rapid abatement in the intensity of the epidemic. He emphasizes the fact that the greater number of local epidemics in the neighboring villages were due to disease transported thither by individuals from Bordeaux.

Bondet²¹¹_{Dec. 25, 27} found that an epidemic which prevailed in the hamlet of Sous-Ville Charmoux was due to defiled drinking-water. Culture experiments revealed the presence of the bacillus typhosus. The epidemic which prevailed in Cincinnati during the months of September, October, and November, 1887, was mild and attended by a comparatively low death-rate. A writer in the *Journal of the American Medical Association* attributes it in part to the drinking-water, which is obtained from the Ohio River at a point near the eastern extremity of the city. Above this point there are several sewers emptying their contents into the river, which was lower that season than for several previous years; also in part to a very extensive tearing up of the streets and turning up of soil for the purpose of municipal improvements. A good many cases occurred in families who derived their water supplies from wells. Gibert²⁰⁸_{Aug. 15} ascribes an extensive epidemic at Havre in 1887 to emana-

tions from the soil transmitted by means of the atmosphere. Yersin¹⁹⁷_{Sept.} likewise ascribes an epidemic which prevailed at Meiringen in 1880, and which he carefully investigated, to emanations from the soil, which had been excavated for the building of an aqueduct.

A striking illustration of the origin and spread of typhoid fever is the epidemic that played havoc in a German artillery barracks²²_{Mar. 22} during more than a decennium, from 1873 to 1885. Almost the whole of the one hundred and forty-six cases occurred in one of two barracks, in which two hundred and thirty-eight men found accommodation, although the drinking-water of both was from a common source. Every inquiry being fruitless of results, the question of the propriety of closing the barracks came up for consideration, when suspicion fell upon the bed-linen and clothing. It was then discovered that three of the recent cases had used the clothing of men that had been attacked, and that the linings of the trousers were almost without exception soiled by dried *faecal* matter, of which a part probably had its origin in typhoid patients. The clothing had previously gone through a routine of disinfection by sulphur vapor, but, as the result showed the disinfection had been *nil*, it was now submitted to thorough cleansing, twelve hours saturation with chlorine gas, and, lastly, dry heat for several more hours. From this time, November 18, 1885, no more cases of disease occurred.

Salle²⁴³_{Sept.} attributes an epidemic of typhoid fever which made its appearance in the Garrison St. Paul, of Verdun, in the spring of 1885, to the accumulation of filthy material underneath the floors.

In a report on the epidemic of typhoid fever which appeared at the Dupleix barracks and in the surrounding streets, Collin¹⁶¹_{Mar.} thought that it merely resulted from the insalubrity of this particular quarter of Paris. He accounted for its appearance in the barracks by the arrival of a regiment of recruits from the provinces, who by their youth, and the fact that they were not acclimated to Paris, were particularly exposed to contract typhoid fever, from which Paris is never free. The regiment being sent to Saint Germain, only two cases of typhoid fever were recorded during the following fifteen days.

Férol¹⁰⁷_{Mar.} reported a local outbreak of typhoid fever at Eaux-Bonnes, a landlord's three children suffering with typhoid fever after a traveler had been sick in the hotel with the same disease.

No contamination of the water was found, but these children slept in a bedroom into which odors from the cesspool found their way.

Fitz, of Boston,¹⁰_{May 24} made a critical investigation of eleven cases of typhoid fever, of which seven probably, and four possibly, originated in the Massachusetts General Hospital in the course of six years. While the evidence of infection within the hospital is in none of these cases absolutely conclusive, Fitz and his colleagues suggest special directions which are worthy of general adoption, not only in hospitals, but, as far as possible, in private practice:

1. Mattresses and pillows (when liable to become soiled) are to be protected by close-fitting rubber covers.
2. Bed and body linen are to be changed daily. Bed-spreads, blankets, rubber sheets, and rubber covers are to be changed at once when soiled. Avoid shaking any of these articles.
3. All changed linen, bath-towels, rubber sheets and covers are to be immediately wrapped in a sheet soaked in carbolic acid (one to forty). Remove to the rinse-house as soon as possible, and soak six hours in carbolic acid (one to forty). Then boil the linen for a half hour, and wash with soft soap. The rubber sheets and covers are to be rinsed in cold water, dried, and aired for eight hours. The bed-spreads and blankets are to be aired eight hours daily.
4. Feeding utensils, immediately after being used, are to be thoroughly cleansed in boiling water.
5. Dejections are to be received into a bed-pan containing half a pint of carbolic acid (one to twenty). The nates are to be cleansed with paper and afterward with a compress-cloth wet with carbolic acid (one to forty).
6. The bed-pan and cloths are to be carried to the tower. Add two quarts of carbolic acid (one to twenty) in divided portions to the contents of the bed-pan; mix thoroughly by shaking, and throw the liquid into the hopper. The bed-pan and hopper are to be cleansed with carbolic acid (one to twenty) and wiped dry. The cloth used for the above purpose is to be at once burned.
7. The corpse is to be covered with a sheet wet with carbolic acid (one to forty).
8. After the discharge of the patient from the hospital, the mattresses are to be thoroughly beaten and aired every day for a week. The bedstead is to be washed with corrosive sublimate (one to one thousand).
9. These directions are to be followed until the patient is free from fever.

Vaughan and Novy,⁹_{Jan. 28} investigated drinking-water used by families in which enteric fever had occurred during an epidemic at

Iron Mountain, Michigan, with a view to ascertaining whether or not poisons would be developed by the bacteria which were suspected of being present in the water. Sterilized meat preparations and sterilized milk were inoculated with the suspected water. Control experiments were made with Lansing water. A syrupy residue was obtained, which contained poisonous ptomaines, produced by the micro-organisms present in the Iron Mountain water. This ptomaine, injected in large doses beneath the skin of cats, produced primary depression of temperature followed by an elevation of temperature. These observers do not regard the substance which they obtained as identical with the typhotoxine of Breger. The presence of the bacillus typhus in the Iron Mountain water was demonstrated by potato culture and by microscopical examination. Vilchur, of St. Petersburg,⁶ from experiments with typhoid stools, found that all the bacilli, however numerous, were invariably destroyed by the addition of a volume of boiling water equal to four times that of the stool. In this way, he suggests, it will be easy to disinfect with certainty all the dejections of typhoid patients. Holmes¹¹⁵ read a paper on secondary mixed infection in typhoid fever, showing the way in which the inflammation of the lymph-glands, caused by the irritation of the typhoid bacillus and its ptomaine, diminishes their resistance to pathogenic and other bacteria.

Pathology.—Dunn¹⁰⁵ contributed a very important and instructive paper upon some mooted points concerning continued fevers of typhoid character in Minnesota. His conclusions, based upon a careful study of one hundred and fifty-four cases with eleven autopsies, demonstrate that there has been no essential fever of typhoid character prevalent in Minneapolis or the tributary country other than enteric fever. This opinion is based upon the following facts: 1. That the cases observed, while deviating more or less from so-called typical typhoid, present such symptoms that a composite picture of the one hundred and fifty-four cases could not be better painted than by the many classical descriptions of this affection given by standard authors. 2. The eleven autopsies made at random confirmed the diagnosis made in each case. The author, after carefully investigating and comparing notes of these one hundred and fifty-four cases, is inclined to believe that typhoid fever runs much the same course in his country as elsewhere. He

thinks that physicians are too inclined to hold before your minds the schematic description of a typical case and of denying essential correspondences of cases not closely conformed to this type.

As to the claim that typho-malarial fever in the sense of a typhoid complicated with a malarial element prevails in that State, he fails to see the slightest evidence. Malaria is certainly not prevalent in Minnesota; if it occurs at all, it crops out rarely and is recognized by few, while the class of cases referred to occur in all parts of the State and are met with now and then in the coldest weather of that frigid climate. There is not a distinct periodicity in the febrile action, there is an absence of icteroid hue of the skin, hepatic tenderness is wanting, and splenic enlargement is less extensive than in malarial affections. Quinine has not the slightest effect in controlling or shortening the disease.

Carroll, ⁶⁰_{Feb. 11}, in an introduction to a discussion on typhoid fever before the New York State Medical Association, held that there is justification for the belief that, apart from errors of diagnosis in cases where the asthenic febrile movement is the result of an overlooked tubercular pyæmic or other determinable primary process, several disorders are commonly found under a single designation, including:—

a. A specific exanthematous fever with a localization in the intestinal glandular apparatus (to distinguish which the title “enteric fever” may be used until we gain a clearer idea of its intimate pathology); transmissible by means of a *materies morbi* developed in the excreta of the sick. One attack, as a rule, protecting against future infection. *b.* A group of acute adynamic ailments (for which the generic term “typhoid” may be provisionally retained), comprising, (1) a septic enteritis (pathogenic?) giving rise to constitutional disturbances like those of enteric fever; (2) perhaps a catarrhal variety (the “gastric” or “mucous” of some writers); (3) an anomalous continued fever, peculiar to warm climates.

As to whether typhoid fever is always the product of a specific contagium from a pre-existing case, or the result of filth fermentation. Carroll concludes that we must face the dilemma of either admitting the pathenogenesis of a specific ferment, or, more plausibly, considering the existence of a separate filth-bred febrile disorder. The phenomena of such cases of “home-brood” fever, as

the author denominates them, correspond with the description rather of the irregular than of the typical form of typhoid. Dunn appears to regard our present knowledge as inadequate to the solution of the question as to the part played by micro-organic ferments in the causation of enteric fever. After quoting a number of authors, he leaves the question unanswered as to whether there is a disease of the lower animals transmissible to man as typhoid fever.

Defiled water, air polluted by exhalations from foul and unventilated sewers, ground air from a filth-saturated soil, and contaminated milk constitute the media of conveyance for the infection. The author does not believe in the immediate personal contagiousness of enteric fever.

As to the complications and sequelæ, it may be broadly stated that there are three classes of phenomena to be noted—those directly dependent on the local solutions of continuity, those arising from secondary degenerative changes, and those presumably caused by the absorption of septic products. Under the first category belong such common accidents as intestinal hæmorrhage and perforation. The second comprises circulatory failure, hypostatic congestion, and œdema, thrombosis, embolism, and infarctions, cerebral or meningeal extravasations, anæmia, or decadence of the nervous centres, parenchymatous nephritis, fatty metamorphosis of the liver, disintegration of muscular and other textures, sloughing, etc. To the third may, probably, be assigned peritonitis without perforation, furuncles, lymphadenitis, parulis, parotitis, some examples of lobular pneumonia, laryngeal ulcerations, meningitis, and other rarer incidents.

Hénocque and Baudouin⁸ investigated variations in the quantity of oxyhæmoglobin and the activity of its reduction in typhoid fever. The observations were systematically made upon eleven patients in accordance with the method devised by Hénocque. In general the oxyhæmoglobin falls to 9, 8, or 7 per cent. during the period of development and the acme, to rise again to 8, 9, 11, and 12 per cent. during the convalescence. At the same time, the reduction increases from the beginning and remains long until convalescence. Convalescence is announced by an augmentation of the quantity of oxyhæmoglobin and by the readiness of its reduction. These ameliorations occur suddenly. The quantity of oxyhæmo-

globin ordinarily diminishes from the eighth day, sometimes even from the fourth day. The daily differences often amount to $\frac{1}{2}$ to 1 per cent., exceptionally to 2 per cent. Marked diminution in the amount of oxyhæmoglobin persists during convalescence. Diarrhœa, pulmonary complications, epistaxis, and other blood loss, pericarditis, parotiditis, suppurative otitis, are followed by a diminution in the quantity of oxyhæmoglobin and in the activity of its reduction, which is, however, greatest at the moment when the temperature reaches its maximum.

Fage⁷⁰_{Nov. 25} contributed an historical review of the subject of retention of urine in typhoid and in the eruptive diseases. Handford⁶_{Apr. 20} read a paper on albuminuria in enteric fever. He gave an account of his observations in seventy-five successive cases that had been under his care in the past three years in the Nottingham General Hospital. There were ten deaths, seven of them due to perforation, giving a total mortality of 13.3 per cent. The cases were classified under three heads: 1. Those with pre-existing definite kidney disease; these cases seemed very rare. 2. Where there was abundant and persistent albuminuria, often to the extent of 0.05 up to 0.01 per cent. Among these the mortality was very high. The most marked change in the kidney in such cases was found to be interstitial, or diffuse nephritis, with glomerulitis and hæmorrhage. The nephritis was probably of septic origin, like so many other complications of enteric fever. 3. Where the albumen only existed as a trace, and that only for a short time. Among them the mortality was much less. The renal changes were less definite, and sometimes scarcely any alteration could be detected. The chief alterations appeared to be vascular engorgement, with capillary hæmorrhage, slight cellular infiltration and multiplication of nuclei, and cloudy swelling of the epithelium. Marked parenchymatous nephritis, with fatty degeneration of the epithelium, was not found, though some degenerative changes were generally present, but difficult to distinguish from alterations which occurred so rapidly post-mortem, especially in death from peritonitis due to perforation.

Cadet de Gassicourt,²⁴_{Feb. 1} has studied the initial anginas of typhoid fever. They appear in three varieties: catarrhal, ulcerative, and pultaceous. They greatly increase the difficulty of diagnosis in the beginning of the disease. He narrates three cases.

Dabney,⁶¹_{Nov. 17} in a paper on the atypical forms of typhoid fever, presents the following conclusions: (1) the disease in this country is gradually becoming milder, and symptoms which were formerly thought to be characteristic and almost invariable are now much less frequently present; (2) the diagnosis of the disease is often attended with extreme difficulty, and in the early stages is generally impossible; (3) in those cases which are apparently extremely mild, dangerous symptoms may arise suddenly, and a fatal issue may ensue from errors in diet or other imprudence.

A study of hourly charts from two hundred cases of typhoid by Ampugnani,²⁵ yields the following results: 1. The temperature oscillates in the course of the day between relatively wide limits, presenting appreciable differences between one hour and another; this variation may exceed 1° C. (1.8° F.). 2. The greatest oscillation between the maximum and minimum of the twenty-four hours is found in the first three weeks; these oscillations are ordinarily of 2° to 2.5° C. (3.6° to 3.5° F.), sometimes touching as a maximum 3.3° C. (5.9° F.). In this period, however, the seventh, fourteenth, fifteenth, and sixteenth days are exceptional; on these days the limits of variation are less, and are between 1° to 2° C. (1.8° to 3.6° F.). 3. From the twenty-second day onward the oscillations are less, being under 2° C. (3.6° F.), and in the later days under 1° C. (1.8° F.). 4. In cases running a fatal course, the oscillations are commonly less and the fever has a more markedly continued character. 5. The greatest depression occurs in the morning hours between seven and ten. On the fifth, fourteenth, and twenty-first days the depression, however, is anticipated, and occurs between 4 and 7 A.M. 6. The highest temperature occurs generally from three to six in the afternoon and then falls to midnight. In fatal cases, however, the maximum is reached toward midnight. 7. High temperatures are not necessarily of evil augury; indeed, the highest temperatures recorded occurred in patients who recovered. As a rule, in the typhoids who die the temperature oscillates between 39° to 40° C. (102.2° to 104° F.), and the cases are very few in which these limits are exceeded.

Eichhorst²¹⁴_{May 1; June 16} has collected the statistics of six hundred and sixty-six cases of typhoid treated at Zurich during three years' time. He found that a second attack occurred in 4.2 per cent

(twenty-eight persons). Susceptibility to typhoid infection was not destroyed by a first or second attack; cases of three and four times repeated infection were observed. The mortality of repeated attacks was the same as those of first illness, and the severity of the symptoms was the same. Men are more liable to repeated attacks of typhoid than women.

Dewèvre³⁶⁰_{Oct., Dec.} discusses the subject of sudden death in typhoid fever. The theory of pulmonary embolism, of thrombosis of the heart, of degeneration of the heart-muscles, of obliterative endarteritis and cardiac ischæmia, are carefully examined, and each in turn rejected as inadequate. So with the ingenious theory of intestinal reflex proposed by Dieulafoy, the curious theory of stomachal reflex of Tambareau, that of cerebral anæmia, of uræmia, and of overwhelming typhoid intoxication. Each may serve, according to the views of its advocates, best to explain cases or even groups of cases, but no one of them is generally applicable.

Sudden death, such as is here described, is a special accident of typhoid fever closely associated with the anatomical changes peculiar to that disease. It comes only in one of three ways: the patient succumbs to one of the common causes of sudden death, as hæmorrhage, embolism, and the like; he dies of uræmia due to the nephritis of typhoid fever, or life is destroyed by special localization of the infecting principle upon the pneumogastrics.

Enteric Fever in Infancy and Childhood.—Keating⁵¹_{Jan.} contributed a valuable lecture on typhoid fever in infancy, embodying important statistics from various sources, and a particularly instructive discussion of the treatment.

Forchheimer²⁸⁴_{Mar.} found that children were very frequently affected in the recent epidemic of enteric fever in Cincinnati; more than nine-tenths of the cases which came under his observation were children. This is largely to be explained by the fact that his practice was chiefly among children. In the majority of instances in children the disease begins suddenly. There is pain in the stomach, usually epigastric, without sensitiveness. Insomnia is apt to be present early, and may alternate with marked drowsiness, the child being wakeful at night and dozing during the day. Epistaxis is absent in a large proportion; 5 per cent. suffered from this symptom; usually it was of slight degree. Sneezing rarely occurs. The tongue is much the same as in adults. Bronchial

catarrh is frequent. Constipation is common. If diarrhœa occur, it is usually moderate. In the majority of the instances the spleen is enlarged. Vomiting is common at the onset of the disease, and leads to difficulties in diagnosis. Intestinal lesions are not so severe as in an adult; they are more distinctly localized, less extensive, and, as a rule, spare the large intestine. Hæmorrhage from the bowels is on this account comparatively rare. Hæmorrhage occurred only once, and there was not a single case of peritonitis in seventy cases. The nervous symptoms were marked somnolence, wakefulness, headache. Changes in the disposition occurred. Those who were studious and agreeable before the sickness became nervous, fidgety, and shy. These disturbances were protracted after convalescence. The heart suffers less than in adults. The frequency of the pulse is not increased proportionately to the fever. Complications are less common than in adults. Aphasia occurred in one instance. Enteric fever in childhood is, according to the author, apt to be followed by tubercular infection. Prognosis is favorable; the author lost not one case of his seventy. He states that during the first two months mortality is very great. The course of the fever is shorter than in adults, usually not exceeding three weeks, sometimes coming to an end in six days. Defervescence may be by gradual lysis or by crisis. In regard to treatment, the author uses early in the disease large doses of calomel, to which he attributes the power of occasionally aborting the morbid processes. He uses antipyrin, cold and lukewarm baths, and the cold pack. Alcohol is useful.

Farnham⁹⁹_{June 7} reported a case of enteric fever in a child three years old, who developed enteric fever at the beginning of her father's convalescence in the same disease. The child complained of being tired, became fretful and indifferent to what usually interested her, and was hot and flushed in the afternoon. These symptoms first appeared about the 1st of November. Temperature reached 104.8 F.° (40.4° C.) on the seventh day, when she was put to bed. Defervescence was complete on the sixteenth day from the first appearance of the symptoms, and the temperature was subnormal for the succeeding ten days.

DeWitt⁵³_{Nov. 17} reported a case of enteric fever in a boy, aged twelve, who developed on the twenty-third day marked hysterical symptoms, associated with supraorbital neuralgia, and with pain

and stiffness in the muscles of the back. These phenomena came on at the time of the higher temperature. Ollivier¹⁴_{Feb. 23} reported a case of typhoid fever with gangrene of the extremities and infarct of the kidney in a child ten years of age. The disease was of moderate intensity, and ran its course normally until the nineteenth day, when there was sudden pain in a portion of the left lower extremity, followed by the apparition of violaceous spots and rapid falling of temperature. At the same time there was a difficulty in speech amounting to a form of aphasia, thin fluid discharges from the bowels, and the area of discoloration of the limb rapidly assumed the aspect of dry gangrene. Four or five days later the child died. At the autopsy the following lesions were found: (1) an obliteration of the left femoral vein; (2) an infarct of the kidney; (3) a bronchial pneumonia; (4) a normal heart. The gangrene was evidently the result of obliteration of the femoral, due either to (a) a thrombosis consecutive to an endoarteritis, or (b) to embolism. The author ascribes it to the latter.

Ewens⁶_{Aug. 4} publishes a fatal case of typhoid fever followed by measles, parotitis, and sloughing of the face in a child aged twelve. Christie¹¹²_{Dec.} reported a case of measles developed during the course of enteric fever in a child eleven and a half years old, which terminated fatally with convulsions. Matiegka⁸⁸_{Sept. 5} likewise reported a case of the combination of enteric fever and measles in a lad sixteen years old. The symptoms of enteric fever were well marked on the fourteenth day of the attack. The eruption of measles appeared upon the face and rapidly spread over the whole body. It is noteworthy that the boy had in his fifth year suffered from measles with the other members of the family. Ringer⁶_{June 30} reported a case of measles occurring during the course of typhoid fever in a girl aged ten. The patient recovered. Ringwood⁶_{July}, apropos of a case of measles occurring during the course of typhoid fever in a patient under the care of Dr. Ringer, communicates notes of a case in which the patient not only had measles and (enteric?) fever concurrently, but also a severe attack of diphtheria followed by scarlet fever and chicken-pox, all within the space of seven weeks. In the course of his communication he asks the following interesting question: "Was all this conglomeration of diseases only different phases of one continuous blood-poisoning, Nature's endeavor to expel the poison resulting in violent storms, each storm

being attended with the group of symptoms that we are accustomed to describe as different diseases ; or, did the germs of five different diseases live harmoniously and flourish synchronously in the blood of this sorely tried patient, feeding on the same diet, and avoiding internecine warfare ; or, did each attack, contrary to usual experience, leave in her system for food the germs of each successive disease during the last six months ?”

Jacobowitsch¹⁵⁸_{Med. u. H. 11, 6 Apr. 21} has made an important contribution to our knowledge of the metabolic changes in typhoid fever in children. The urine giving perhaps the best indications of the tissue changes as in any other disease, he insists on the necessity for knowing the actual quantity of nitrogenous material daily ingested, and also the quantity of urine and other excreta, together with the daily loss of carbonic acid and water. There is a considerable diminution in the quantity of urine passed during the pyrexial period, but no definite correspondence was noted between the elevation of temperature and the quantity of the urine.. At the end of the first week there was a loss which varied from fifty to two hundred cubic centimetres, and even to five hundred cubic centimetres in some cases, the quantity voided being only one-half of the normal. These diminutions were rather increased during the second week, whereas at the end of the third week the quantity tended again to rise, and in some of the cases was twice the amount of the second week. During the fourth week the normal was still not reached. As a rule, the color of the urine was deeper red the less the quantity passed ; but this did not always obtain, for in some instances the color was nearly natural. The reaction was usually acid—sometimes, however, only slightly. As was to be expected, the density of the urine was inversely proportional to the quantity. Gerhardt states that albuminuria results from variations in blood pressure due to the pyrexia, but Jacobowitsch does not substantiate this, for he detected no albumen in the urine in his cases at any period of the disease. The estimations of the urea discharged during the disease are very interesting, and appear to be arranged in two classes ; in one the urea discharge was large during the first week, but then gradually lessened as the disease progressed ; in the other class the discharge of urea gradually augmented with the continuance of the fever, and continued to rise until the fever ended. The uric acid discharged was found to correspond with

the elevation of temperature, and to be greater during the pyrexia of the first period than during the later stages of the disease. A diminished excretion of chlorides was noted all through the morbid process. The excretion of phosphates and sulphates also was grouped into two classes like the urea, in one the quantity being increased at first, but then lessening by degrees, and *vice versa*. Jacobowitsch believes that the activity of the poison in the blood has more influence in altering the urine than has the fever or the febrile accompaniments.

Levin,^{6,11} investigated the lesions of the ganglia of the trunk of the pneumogastric. He finds that in typhoid the ganglion is frequently affected by an inflammatory process, there being marked hyperæmia, and sometimes extravasation of blood or granular changes in the nerve-cells, which leads to their atrophy or breaking down, and to hyperplasia of the connective tissue of the nerve. These morbid changes have as their result, as Dr. Levin believes, typhoid laryngitis and paralysis of the pharynx, cardiac irregularities unconnected with high temperature, the so-called "sudden death of typhoid," spasmodic dysphagia and vomiting, and finally dilatation of the stomach, observed by many authorities in cases of typhoid.

Association of Other Acute Infections with Enteric Fever.—Manquat,¹⁴ discusses this subject as follows: 1. The broad statement is made that two general affections may develop simultaneously in the same subject. The two morbid states may be chronic, as syphilis and scrofula, tuberculosis and diabetes, diabetes and paludism, paludism and oxaluria. 2. An acute general malady may arise in any individual suffering from a chronic constitutional disease. 3. Two general acute maladies may undergo an evolution simultaneously in the same subject. The fact is to-day indisputable, but it must be remembered that these accidents are rare; it would appear that the organism wholly invaded by the infecting principle of one malady is for the time being less susceptible to the specific infection of another general acute malady. Nevertheless, many examples of such association are recorded. Pneumonia is a striking instance of this.

Apropos of an interesting case of the simultaneous evolution of enteric fever and scarlatina, the author gives an elaborate review of the whole subject of the association of these two diseases.

Couturier⁶ has observed a case of disseminated sclerosis in which great amelioration of the symptoms was apparently produced by an attack of typhoid fever, the ankle clonus and other exaggerated movements being notably diminished.

A case of enteric fever is recorded¹⁷⁷ in a girl nine years old, who, upon the seventeenth day of her illness, was seized with colic, and fell into a syncope, which was followed by intestinal hæmorrhage. At the post-mortem examination one of the Peyer's patches was found deeply congested, violaceous, ulcerated, and perforating the intestine. Internal hæmorrhage in the course of typhoid fever in children is exceptional. Simon, in twenty-one years of practice, encountered only three cases, all of them children about the age of eight or nine years. Two recovered. Potain¹⁰⁰ reported the case of a man forty-seven years old, well-nourished, formerly a *valet de chambre*. Being out of a place, he entered the hospital two and a half months previously as a nurse. After a little time he experienced depression and loss of appetite, and his tongue became white. Upon purging he improved a little; a month later he was obliged to take himself to bed with fever, coated tongue, and diarrhœa. After purging he was able to again undertake his duties, but from this time he became depressed, suffering from malaise, which, gradually increasing, obliged him to become a patient. Fifteen days later he complained of active headache and general depression, the tongue becoming deeply furred; upon auscultation signs were negative. Examination of the abdomen showed not a single spot, but an enormously enlarged spleen. The temperature was 39.8° C. (103.6° F.). The diagnosis was uncertain. The patient had never resided in a malarious country, never suffered from intermittent fever. After a time, however, the spleen diminished in volume, which would not have been the case had he suffered from malarial fever. The case is not fully reported.

Bruhl¹⁵² reported a case observed in the Hôpital de la Charité. Patient, aged sixty-one; admitted on the first of August, 1887; of robust constitution; exempt from hereditary taint; married; father of a family; not addicted to alcohol; subject to migraine; suffered from chronic bronchitis, which had, however, no influence upon his general condition. A month prior to admission he had lost appetite, was depressed, easily fatigued. He entered the hospital in a very apathetic condition; suffered from frontal headache

of moderate intensity; had neither epistaxis nor vertigo nor ringing in the ears. From the time of admission his tongue was dry, and tended to become fulliginous; there was moderate meteorism, no abdominal pain. Five days after admission, spontaneous diarrhœa occurred, amounting to from three to five passages daily. Patient complained greatly of dryness of the mouth, pharyngitis, and laryngitis. The throat was red, voice hoarse, deglutition occasionally painful. The hebetude was pronounced, the patient replying unsatisfactorily to questions. The diagnosis of typhoid fever was obvious. The evolution of the affection was normal; in four weeks the patient was completely apyretic and recovered his appetite. During this time temperature range was continuous, oscillating between 38.5° (101° F.) and 39.5° C. (103° F.). Pulse was slow and dicrotic. Patient continued to cough and expectorated moderately, and upon auscultation there were coarse mucous râles. On the 24th of August the tongue was still dry, but it was red and not coated; the patient aroused himself, stated that he felt better, and asked for food. Bronchitis also improved and the râles disappeared. From the 29th of August convalescence progressed regularly without accidents. On the 21st of September, after a convalescence of three weeks, the patient was discharged to the Convalescent Hospital at Vincennes. The day after his arrival at Vincennes, after exposure, he took cold and the cough returned. The following day there was recurrence of fever and diarrhœa. On the 3d of October, he was sent back to the Charité. Upon his arrival the temperature was 39° C. (102.2° F.); there was diarrhœa amounting to eight or ten discharges, liquid, yellow, fetid, in the course of twenty-four hours. The cough was excessive and the expectoration abundant. This illness proved to be a well-characterized attack of typhoid fever. The rose spots were numerous, the bowel distended, the right iliac fossa tender upon percussion, etc. Auscultation of the lungs revealed the signs of generalized bronchitis. Diagnosis of relapse of fever was made. On the 10th of October the temperature became higher, and on the 11th reached 40.4° C. (105° F.). At this date there was intense dyspnœa with great adynamia. The patient showed extensive dullness at the right base, where there was also upon auscultation a mixture of crepitant and fine subcrepitant râles and tubular breathing. Eight days later the patient

entered upon convalescence, which was somewhat prolonged, but terminated in complete recovery. This case is a good example of typhoid fever in advanced life.

The prognosis of typhoid fever at this period of life is generally grave. The patients frequently succumb to the attack, a fact which Bruhl invokes to explain the rarity of relapse. In this case the relapse was very well marked, although late. It must be regarded as a well-characterized recurrence of the permanent infection.

Da Costa¹⁴⁴ reported a fatal case of enteric fever complicated with suppurating inguinal bubo of the left side. There were no indications whatever, upon careful examination, of any form of venereal disease.

Winkoureff⁷_{Dec. 27} has placed on record a case of gangrene of the mouth and partial necrosis of the superior maxillary bone occurring at the beginning of convalescence from typhoid fever in a little girl six years old. Swelling of the left cheek was observed on the eighteenth day of the sickness, when there was also noted excessive fetor of the breath. On the third day a black spot the size of a pea made its appearance near the left angle of the mouth. Great redness of the right side then appeared. On the seventh day the eschar separated, leaving a circular perforation the size of a franc communicating with the cavity of the mouth. The case ended in recovery.

Da Costa⁶²_{June 1} reported a case of repeated intestinal hæmorrhages with periostitis of the left tibia in a man thirty-five years of age. The case terminated in recovery. Vinay²¹¹_{June 10} relates the case of a man of twenty-four years of age who died on the eighteenth day of typhoid fever, after violent pains in the right side. He had been treated by cold baths and sulphate of quinia. Two or three days after the discontinuance of the cold baths, which were not well borne, there developed an eschar over the sacrum. At the autopsy there was neither peritonitis nor ulceration of the Peyer's patches; the spleen was voluminous. At its anterior inferior border was a small inflammatory focus of the peritoneum covering an abscess the size of a walnut; also miliary abscesses in the kidneys.

Whence came the germ which had produced this pus, from the eschar of the sacrum, a pyogenic microbe, or from the bacillus typhosus itself? Roux inoculated the pus from the abscess in

tubes of gelatin, and obtained pure cultures of Eberth's bacillus. Potato cultures gave colonies of the same microbe.

Lineæ Albicantes in Typhoid Fever.—Troisier⁴²⁰_{No. 12, July 21}⁶ has given an interesting account of the atrophic lines so common after any distention of the skin which appear without any obvious cause of stretching. Manouvriez and Bouchard have recorded such cases occurring in the course of convalescence from typhoid fever. These lines have been noticed, especially in children and young adults. Bouchard considered that they were due to stretching resulting from rapid growth after the subsidence of the fever. Troisier and Menetrier have noted that the elastic tissues of the skin are less thick at the level of the "atrophic" area, but they failed to find any real evidence of wasting of tissue; the elastic fibres were simply torn through and curled up at their broken ends. Bucquoy said that in boys the whitish lines have no special distribution, but in girls the breasts and the iliac crests appear to be chosen sites. Barié referred to a case in a girl, aged seventeen, in whom the lines were situated over the tibio-tarsal articulation on each side.

Bradshaw¹⁸¹_{July} exhibited a girl thirteen years of age who had typhoid fever, followed after a fortnight by a severe relapse, and again after twenty days by a second relapse. When she finally entered upon convalescence it was found that the interior surface of the lower third of the thighs and the patellæ presented five or six horizontal parallel markings, the longest reaching to about one-third of the circumference of the limb, and about one-half an inch in width, the smallest under an inch in length and narrow in proportion. They were pointed at the ends, regular in contour, and almost precisely similar on the two legs. The condition is one of atrophy of the skin, probably due to some lesion of the nervous system. It has been described by Wilks.⁴²⁸₁₈₆₁

Sequelæ.—Lucas-Championnière²¹²_{Feb.} recorded a case of thrombosis of the femoral artery in a female patient in the Hôpital Necker. The patient, some days after convalescence from a benign attack of enteric fever, was suddenly seized on the evening of the first day of sitting up with fever, which recurred upon the following day, when there was developed an acute pain in the left inferior member, quickly followed by loss of power of movement. The pain was especially severe in the flexure of the groin, and extended

downward in the course of the vessels. Elsewhere throughout the limb the pain was vague and diffuse, movements of flexion and extension being very difficult and painful. There was swelling, confined to the thigh, and especially to its upper part. The surface of the limb was not reddened, but slight distention of the superficial veins indicated venous stasis. The absence of redness of the integuments and of grave constitutional disturbances preclude the idea of a deep phlegmon of the thigh, such as occasionally occurs in infectious states. Still less did the symptoms point to myositis, though this affection is by no means rare after typhoid fever; it is, however, less generalized, being restricted to certain muscles and ushered in, as a rule, by violent muscular cramp. There was evidently a vascular obstruction. Palpation showed the existence of a hard cord in the course of the inguinal vessels. That this obstruction was not venous was shown by the localized œdema of the upper part of the limb, in place of diffuse swelling in its whole extent; by the normal coloration of the integuments, which were but slightly congested, instead of being wan and discolored as they are in phlegmasia alba dolens. The trouble was, therefore, located by exclusion in the femoral artery. Pulsation in this vessel and its branches had disappeared, but was to be felt in the iliac artery, and the circulation of the member was supplied by the collaterals.

This case presents an excellent picture of the symptomatology of arteritis consecutive to typhoid fever. However, obstructions of this kind are not invariably due to thrombosis. They may be produced by an embolism, in which case there is usually some cardiac affection with or without manifest signs of disturbances of the heart. When such an embolism occludes an artery, sudden intense pain arises with coolness of the extremity and very painful muscular cramp. The obliteration of an artery by thrombosis or the spontaneous coagulation of the blood in acute infections is extremely rare. This form of thrombosis is much more common in the veins. Finally, the obliteration by arteritis is much more frequent. It was probably produced in the above-mentioned case by movement. It always occurs at the points of flexure and curve in the arteries. The clot which leads to the complete obliteration of the artery is not necessarily voluminous, as there is associated with it thickening of the intestinal coat of the artery, a fact which

explains the occasional re-establishment of circulation in the course of a few days. In the case under discussion the clot underwent resorption or disintegration without producing secondary emboli. There are, however, grave forms followed by gangrene. In one group of cases the onset of sudden and general gangrene is rapidly established. In another group the pain is subacute, violaceous patches appear, and gangrene gradually develops. In cases that terminate favorably there is apt to persist a certain degree of impairment of motion. Rendu saw a patient, who, as a result of arteritis following typhoid fever, was rendered incapable of military service. In the greater number of cases the interference with movement persists for several months.

Treatment consists in absolute repose, tonics, and an abundant dietary. Massage is to be avoided.

Ollivier²³⁴_{Dec. 31, 97} reported a case of chlorosis occurring after typhoid fever in a girl aged fourteen years. There is no reason to believe that the chlorosis was dependent upon rapid physical development nor upon menstruation. An important fact was the improper management during the course of the attack of fever and the persistent and abundant diarrhoea during and subsequent to the evolution of the illness. The alimentation had been throughout insufficient. Prognosis was favorable, and treatment consisted in the employment of iron and quinine. Arsenic was also indicated. Good results were obtained from hydrotherapy, both general and local; later, in the form of douches over the spleen.

Zenner²³⁴_{Jan.} reviews the present state of knowledge in regard to nervous manifestations of enteric fever. As regards prognosis, he calls attention to the fact that delirium is more common in severe cases and is to that extent an unfavorable indication. Further, the greater the delirium, the greater the danger to life, while the mortality with light delirium is less than 20 per cent. In cases of severe delirium it reaches over 50 per cent., and when the delirium is complicated with sopor to almost 70 per cent. The mortality of initial delirium is high, being more than 30 per cent., and that of delirium occurring during the first week of the fever is over 40 per cent. The value of delirium in prognosis consists in the fact that it is to some extent, according to the author, a measure of the gravity of the infection. As to the restoration to mental health, about one-third of the cases get well within a week, while in one-

fourth the mental disorder continues for months and years, and in one-half of the latter class it becomes permanent. The prognosis is more favorable in febrile than in post-febrile. Of the former more than one-half get well within a week, while less than 7 per cent. are incurable; of the latter, however, only one-sixth get well within a week, while 20 per cent. are incurable. In many cases of typhoid, even after complete convalescence, a weakened condition of the nervous system remains which predisposes to future nervous diseases. The necessary treatment is mainly that required by the typhoid fever itself and the systemic conditions present. The author points to the fact that the introduction of antipyretic treatment appears to have lessened the frequency of delirium, and quotes Betke to the effect that prior to the use of the cold-water treatment delirium occurred in 26.7 per cent. of the cases in the Basle Hospital, while since its use delirium has been reduced to 19.3 per cent.; also, that the mortality of delirium cases, which before the use of cold water was 43.5 per cent., has been reduced by that treatment to 30.5 per cent.

Ross,⁹ in discussing some forms of paralysis which follow typhoid fever, first showed that while typhoid is a great strain on the nervous system, bringing to light its weaker points and causing general exhaustion and anæmia, it produces sometimes nervous lesions in addition to these. These lesions consist in proliferation of connective tissue (interstitial neuritis) about the nerve-trunks, usually, but also parenchymatous degenerations of the spinal cells and cerebral cortex. The results are paralysis, paraplegia, and sometimes loss of sensation. These are, however, usually recovered from. They are undoubtedly caused by the typhoid poison, not the fever exhaustion or the anæmia. The signs of exhaustion of the nervous system are constant and generally in proportion to the severity of the fever. The nervous phenomena are almost invariably both motor and sensory. The variety of forms taken is very great, though mainly the nervous injury is manifested by pains, areas of increased cutaneous sensibility, and paralysis.

Parker²¹³ reported a fatal case of enteric fever in a male, aged twenty-four years, in which the post-mortem examination revealed the following signs of meningitis: "Dura mater firmly adherent to the bone; whole surface of brain, base, as well as convexity,

presenting signs of inflammation ; opposing surfaces of Sylvian and longitudinal fissures adherent."

Lesage ⁹²_{Nov. 16} observed a case of hypertrophic myopathy secondary to typhoid fever in a man twenty-seven years old. On the nineteenth day of the attack there was suddenly developed an acute pain in the left thigh, with great tenderness upon pressure in the course of the deep vessels. This pain extended to the extremity of the limb. There was slight œdema. Diagnosis of phlegmasia was made. Some months afterward there was found a general increase in volume in the left lower limb. It was decidedly greater than the right. The hypertrophy affected exclusively the muscular masses. The muscles were of firmer consistency in the left than in the right leg. The electrical reactions were identical with those of the other leg. There was no reaction on degeneration. The reflexes were normal and equal on both sides. There was no idiomuscular contraction. The sensibility was normal and identical on both sides. There was neither anæsthesia or hyperæsthesia. Pain and tenderness were alike absent. After fatigue there were cramps. The surface temperature of the affected member was $2\frac{1}{2}^{\circ}$ C. ($4\frac{1}{2}^{\circ}$ F.) higher than the sound member. There was slight œdema and cyanosis toward evening after the patient had been all day upon his feet. Muscular hypertrophy gradually increased, and after a few months became stationary. It has not changed during the past two years.

Diagnosis.—Potain ¹⁰⁰_{Jan. 26} calls attention to the fact that the diagnosis in some cases is rendered obscure by the diminution or absence of certain symptoms, in others by the predominance of certain symptoms or by some complication. When the fever is of mild type during the first week the diagnosis becomes very difficult, and halts between: 1. An ephemeral fever, the cause of which is not apparent, and which may be of the same nature as that of enteric fever. But here in three or four days the affection runs its course, and the stages of the malady are much more rapid. 2. Scarletina ; but here we have the throat affection and temperature reaching a maximum in the course of the first day or two. 3. Variola ; the more gradual access of fever through the first three days associated with pain in the back and vomiting. 4. Measles ; evolution in four or five days, bronchial catarrh, and oculo-nasal catarrh. 5. An inflammation of the deeper structures

of the ear, intense cephalalgia, great mental depression, active fever with marked oscillations of temperature, localized pain, tenderness upon pressure over the mastoid processes, impaired hearing upon the affected side. 6. Pneumonia; diagnosis is sometimes difficult in the case of intensely developing pneumonia, the physical signs of which at first and during the early days may escape attention. 7. Interstitial nephritis; this affection may be accompanied as the result of insufficient elimination of waste by phenomena analogous to those of *dothiémentérie*. Diagnostic data must then be sought, not so much in the presence of albumen as in the disturbance of the circulation, as arterial tension, bruit gallop, etc. 8. Intermittent fever; here there are paroxysms which are readily distinguished from the oscillations of enteric fever. Sometimes, however, the latter rises by an access of tertial fever; in other cases, the two maladies may be simultaneously present in the same subject. Potain states that he has observed this in a young medical student, who manifested at the same time the effects of paludal and typhoid infections.

When enteric fever has advanced to the second period, we have, as a rule, the lenticular rose spots and the enlargement of the spleen. Even then, however, there are occasional cases lacking the abdominal phenomena, or extremely mild. Sometimes there is complete absence of adynamic phenomena. Notwithstanding, from the second period the fever presents a subcontinuous character. On the other hand, difficulties of diagnosis may arise from the exaggeration of certain symptoms: thus it may be confounded with some eruptive fever or with pneumonia. The signs of one or the other of these maladies after a time render the differentiation easy. 1. Ataxia; usually ataxic phenomena appear only in the second week; in certain cases, however, delirium has been observed in the first week of the attack. 2. Meningitis; but here we have initial delirium, exaggerated constipation, less intense fever. Or, the adynamic phenomena being exaggerated, the fever moderate, and coma being present, we may be led to suspect (3) uræmia; but here again disturbances of the circulation permit of a correct diagnosis. In certain cases, thoracic symptoms are so fully developed as to lead to the diagnosis of some pulmonary affection. Occasionally typhoid fever begins with pneumonia; or pneumonia may develop in the course of the fever with profound depression.

To this condition the name "typhoid pneumonia" has been applied; but then the critical defervescence of pneumonia fails to occur upon the ninth day and the disease runs its course, on the contrary, as if the typhoid fever dated from the first day of the pneumonia. In such cases, we may say that the pneumonia has been one of the manifestations of the typhoid fever. Here the diagnosis is practically impossible until several days have elapsed.

Sheard²⁵⁷_{Aug.} sums up an elaborate paper upon enteric fever as follows: (1) that save in those cases where death takes place from the action of the typhoid poison directly on the nervous system there must be intestinal lesion to prove the existence of typhoid; (2) that with such intestinal lesion we will have distinct abdominal symptoms; (3) that acute tuberculosis and septicæmic states are often mistaken for ordinary typhoid; (4) that evening rise and morning fall of temperature, as a proof of the existence of typhoid, is deceiving.

Ball⁵⁹_{Sept. 1} discusses the difficulties in the diagnosis of typhoid fever in an elaborate and instructive paper. Among other things, he shows the difference between acute nephritis and the renal form of typhoid fever described by Gubler and Robin. He also dwells upon the difficulties in the way of the differential diagnosis between certain forms of typhoid fever and acute rheumatism. Cases of this kind have been described by Bourcy and Wagner.

Jaccoud³_{Nov. 26} discusses at some length the subject of abortive typhoid fever, and dwells upon the difficulties of the diagnosis. He concludes his remarks with the statement that the diagnosis of typhoid fever up to the time of the appearance of the exanthem constitutes one of the most difficult problems of practical medicine.

Geographical Distribution.—Johnson⁹_{Oct. 4} read a paper entitled "Geographical Distribution of Typhoid Fever in the United States," in which he showed that the principal forms of fever recognized are: (1) true typical typhoid fever; (2) true typical malarial (remittent or bilious) fever; (3) adynamic malarial fever; (4) typho-malarial fever; (5) numerous obscure forms, variously reported as simple continued fever, gastric fever, autumnal fever, etc. He found that true typhoid and true remittent fever are clearly defined, and that the others are terms used to designate sometimes a case of typhoid, sometimes of remittent fever. As

regards the term typho-malarial fever, much would be gained by abandoning it altogether.

Riordan²⁰⁶_{July} holds that enteric fever is rare in India, and that the continued fever which has been described as enteric in India is in fact a form of malarial fever; going on to say that in a few cases of remittent fever without any suspicion of enteric, he has observed what he wishes to describe as the characteristic lesion of this malarious enteritis, viz.: considerable thickening of the last two or three inches of the ileum, increasing gradually at the site of the mesenteric attachment, with deep, irregular ulceration, ragged margin, and ragged floor, as if a Peyer's patch, sometimes two, with several solitary glands and the intervening mucous membrane, eroded. The solitary glands appear to be more affected than the agminate. There is, in addition, considerable intestinal congestion, with rectal stasis, congestion, enlargement of liver and spleen, and hypostatic congestion of the lungs. A considerable number, up to twenty, of the Peyer's patches may be simultaneously affected, but this is accidental, not essential. This, he submits, is the disease of which so much is seen in India. It differs from true enteric fever in its pathology, not perhaps conclusively, but appreciably; in its symptomatology it is all round at variance with the European disease; while in its etiology it has nothing in common with the specific fever.

I regard the above statement as abundant proof of the existence of enteric fever in India.

Hamilton²⁰⁸_{Aug.} believes that the vast majority of cases of continued fever in India are true enteric fever.

Treatment.—Davezac,¹⁸⁸_{Jan. 3} in the selection of treatment, divides the cases into three groups, those in which the disease is benign, those in which it is grave, and those in which it is from the beginning probably mortal. In the first group of cases, the task is easy; in the second, it will demand on the part of the attendants a large degree of prudence and decision; in the third, the mischief is quickly beyond our reach. This classification, convenient for discussion, is entirely justified by observation.

I. First Group.—The evolution of the attack is simple and regular. It is not to be disturbed by any intemperate medication, such as repeated purgations, too often liable to bring about unmanageable diarrhœa, nor by a *régime* too severe, or, on the other

hand, ill-ordered. It is not to be forgotten that relapses are to be feared even in these mild cases, and that they are sometimes more redoubtable than the primary attack. These are the "typhoidettes" of Lorraine and Brouardel, always numerous in epidemics and particularly in that observed by that author at the time of writing in Brussels.

II. Second Group.—The disease shows itself to be serious, but the prognosis, in the absence of complications, continues to be favorable. Here the physician has much to do. It is possible for him to do much harm; on the contrary, he must see to it that he does great good. It is in the management of this form of typhoid fever that we employ the customary remedies. We recognize that the primitive infection of the individual by the morbid germ is not of such gravity as to render a fatal issue inevitable. The two principal dangers to the patient consist in hyperthermia, which tends rapidly to exhaust the nervous system, and, a little later, in a putrid infection which has for its point of departure the intestinal ulcerations. In addition to these, there are complications. The author declares himself a partisan of the treatment by cold baths, a treatment that may be carried on upon a sufficiently extensive scale in hospital practice, but for which in private practice it is not often possible to attain the experienced attendants and the necessary appliances. He cites the mortality at Croix-Rousse, in six years, four hundred and eleven cases, with thirty-one deaths, a mortality of 7.54 per cent., whilst prior to the introduction of this method the mortality was from 25 to 26 per cent. At the Hôtel Dieu, where the treatment is mixed or exclusively by means of medicaments, the mortality during the same period was 13.83 per cent. Every effort should be employed to overcome the resistance of families and their patients. They may have recourse to the wet pack or to lotions and affusions where the cold bath is impracticable. The author does not think internal antipyretics should be avoided; on the contrary, there are occasions when they are useful and necessary. To combat the second danger, namely, the putrid infection, internal antisepsis is necessary. The method of Bouchard, which consists in the administration of iodoform or naphthol associated with charcoal and glycerin, is somewhat difficult in practice. The patients after a time refuse to take it and become suspicious of their nourishment. The author's colleague,

Rondot, has obtained great advantage from corrosive sublimate each day. His patients show temperature curves that are most satisfactory as a result of this treatment, which has not, however, been carried on sufficiently long to warrant positive conclusions.

III. The author asks what medication we are to oppose to the fulminant cases, accompanied so often with a terrible and continuous elevation of temperature. The disease advances with rapid strides and nothing seems to check its course. The dose of the poison is too great, either absolutely, or in relation to the powers of resistance of the organism.

Ollivier ²⁰⁸_{Mar. 15} holds that, if you wish to apply to typhoid fever a rational, efficacious treatment, you must keep constantly in view the fact that you are dealing with an infection, and that, after having produced a certain number of lesions, this infection is re-enforced by multiple intoxications, of which the principal source is in the digestive tube, which may also result from alterations in the different organs. The disease is often at its beginning, whether it be gradual or abrupt, accompanied by constipation, and the indication to combat this symptom by purgative is natural. As a result of this there is not infrequently established a diarrhœa which becomes persistent. The author recommends saline purgatives, suggests sulphate of soda or citrate of magnesia in moderate doses for the following reasons: The specific intestinal lesions are accompanied by a gastro-intestinal catarrh. The saline purgative not only relieves the constipation, but it at the same time favorably modifies the secondary catarrh. It also stimulates the function of the kidneys, which is so important in all infections. Finally, the intensity of the fever itself is modified by the action of the purgative. In practice the patient receives during the first ten or twelve days of his sickness, at intervals of three or four days, fifteen or twenty grammes (two hundred and thirty-two to three hundred and nine grains) of sulphate of soda, which stimulates the contractility of the intestine, empties it of the putrid materials which it contains, and often suffices to maintain the diarrhœa within reasonable limits. He only has recourse to astringents, such as the subnitrate or salicylate of bismuth, when the diarrhœa by its abundance constitutes a veritable danger. Calomel also has been much praised. This drug may be administered in two methods: 1. In single doses of thirty to fifty centi-

grammes (four and one-half to seven and one-half grains), which, over and above their purgative effect, have a direct action upon the microbes of the intestine. 2. In broken doses, one centigramme (one-sixth grain) every hour until salivation is produced. This method seems to have given a remission more marked than the other purgatives.

The author remarks that the microbes of typhoid fever, in traversing the intestine, effect a lodgment in the isolated and agminate follicles, and to be affected they must be there acted upon. Further (objection more serious), Bouchard found that the employment of calomel after convalescence prolonged greater feebleness and tendency to hæmorrhages, and finally pneumonia and endocarditis. (The editor begs to call the attention of the reader to the fact that certain of these complications must be coincidences rather than effects of the use of small doses of calomel.)

Ollivier has employed in all his cases daily enemata, either of starch-water or of simple water, according to the presence or absence of diarrhœa. In this way lavage of the large intestine is effected, while at the same time the small intestine is caused to contract, thus relieving itself of its contents. In this manner, also, antiseptis is produced without antiseptics. Enemata of carbolic acid or antipyrin, often producing merely transient results and being liable to be followed by depressing phenomena, do not seem to merit general use. If to these means of indirect antiseptis it is desired to join medicants that in passing through the intestine may neutralize the putrid material there contained, it is necessary to follow the plan of Bouchard, which consists in the administration of insoluble antiseptics which traverse the intestine. Bouchard has proposed a complex mixture which is at once antiseptic and nutrient, consisting of the following ingredients:—

Glycerin,	200 grammes (3 64).
Powdered charcoal,	100 " (3 3 and 3 2).
Peptone,	50 " (3 1 and 3 5).
Naphthalin,	5 " (gr. 78).
Iodoform,	1 gramme (gr. 15).

The whole quantity to be taken in twenty-four hours. The small proportion of naphthalin absorbed is eliminated as naphthylsulphite of soda in the urine, which it colors a dark brown. Lépinc has advised for the same purpose phenacetin.

As regards antiseptis, the author regards quinine as the only

substance which at present appears to give positive results. He insists upon the importance of the disinfection of the secretions, especially of the discharges from the bowels, and recommends that the patient shall be rendered as aseptic (*sic*) as possible by the vapor of iodoform given off from a compress of iodoform gauze kept upon the abdomen during the whole course of the sickness; that the atmosphere of the room should be changed several times a day and purified by the vaporization of carbolic acid. He disapproves of antipyrin, but uses quinine to reduce temperature in doses of seventy-five to eighty centigrammes ($11\frac{1}{2}$ to 12 grains) when the temperature reaches 39° C. (102.2° F.).

The fever usually falls upon the same day from 5° to 1° C. (9° to 1.8° F.). The fall of 1° to 3° (1.8° to 5.4° F.), brought about by doses of two grammes (thirty-one grains) at once, the author regards as dangerous and as subjecting the patient to the risk of sudden death, such as has been attributed by Hayem to a lesion of the myocardium, by Dicuafey to intestinal reflex, by Cornil to modifications of the blood produced by the fever. He prefers small doses given from time to time as long as the temperature remains above 39° C. (102.2° F.) and discontinued when it falls below that point. If, notwithstanding the administration of quinine, the temperature remains elevated, he has recourse to sponging, either with aromatized water, or with aromatic vinegar, as recommended by Jaccoud. He believes that the indications for the employment of cold baths according to the method of Brand are extremely restricted and that one should reserve this treatment for desperate cases, and even then he would prefer the gradually cooled bath; he expresses the same view in regard to local refrigeration by means of compresses, cold enemata, etc. The adynamia resulting from the infection, the secondary intoxications, the pyrexia resulting from visceral congestion, should be energetically combated by tonics and alcohol. The complications are to be treated energetically. Pulmonary congestion, by dry cups applied to the chest and the thighs several times a day; if necessary, by sinapisms, and, if the congestion threatens to pass into pneumonia, by blistering, which is not likely to be followed by gangrene. One must be on his guard against otitis. The throat must be carefully inspected and gargles of Vichy water, solution of borax, or applications of nitrate of silver are recommended. The mouth is to be carefully

cared for. If vomiting occur, its cause is to be carefully investigated; it is often found to be due to an indigestion produced by the alimentation or medication. Much importance is given to the necessity of a systematic analysis of the urine. Insomnia of the early days is to be treated by aromatic draughts or small doses of chloral, measures to which it does not always promptly yield. He considers opium inadmissible at this period. Delirium is much more favorably influenced by cold bathing than by medicines. Musk associated with camphor in pills has been found advantageous. Intestinal hæmorrhage and perforation are to be treated by small doses of opium repeated every hour. Eschars are to be bathed with solutions of boric acid and dressed with iodoform gauze. Abscesses and furuncles are to be incised and dressed antiseptically. Constipation occurring at the close of the attack is to be treated by castor-oil or by emollient enema. To stimulate the appetite and to relieve intestinal atony, the bitter tonics, and especially nuxvomica, are recommended; more frequently, it will be necessary to restrain the patients from eating too much food.

The editor has introduced the above extract, not as an example of the views at present held, but because he considers it desirable for historical purposes to represent all phases of current opinion.

Bathing.—Glénard²¹¹ reviews the subject of the treatment of typhoid fever by cold baths in the French army. He states that this method of treatment, which has been employed in the hospital at Lyons for fifteen years, has only recently been adopted in the Paris hospitals.

Juhel-Rénoy²⁵ read a paper before the Société Médicale des Hôpitaux on cold bathing in typhoid. He had treated forty-three cases in this way, with only three deaths. Sixty-five baths were given in each case. The nature of the disease was established beyond a doubt in every instance. In the discussion Juhel-Rénoy stated that cold baths prevent hæmorrhage, pulmonary complications, and syncope, modify the diarrhœa, and clear the urine, which is secreted in great abundance. Among his patients were pregnant women, hysterical, alcoholic, and tuberculous patients. In cases of perforation of the intestine and peritonitis, cold bathing should never be employed. Dujardin-Beaumetz remarked that Quinquaud had proved that cold baths increase organic combustion,

and consequently the production of heat. He admitted that cold baths may act as a tonic, but the same result was obtained with tepid baths, which were not so dangerous. The increased arterial tension produced by cold baths might cause sudden death in cases of cardiac weakness. Richeaux had treated seventy-six cases by the ordinary methods, and thirty-eight by the method of Brand. In the first series the mortality had been 10 per cent.; in the second series, 5.25 per cent. He was convinced that the cold baths had saved the lives of certain individual cases. "Typhoid cases present an entirely different aspect since the methodical employment of cold baths. Medication by cold baths is not to be classed as part of ordinary treatment. It is a true method, applicable to almost all cases, and which produces in almost all positive advantages, and which is only rarely contra-indicated." The bronchitis of enteric fever, the infectious nephritis, among others, constitute a special indication for the use of cold baths. Of two cases of intestinal hæmorrhage, one, due to ulceration of the intestine, in a patient not treated by baths, terminated fatally; the other coming on early, probably due to congestion, in a patient who was nevertheless subjected to the treatment by baths, terminated in recovery.

Vigier treated thirty-six cases by the systematic cold bathing, with three deaths—5.5 per cent. Cozal expressed himself as follows: "In the last epidemic of typhoid fever at Claremont it was impossible for me to rigorously employ the method of Brand among the soldiers; nevertheless, I gave many cold baths, and I am persuaded that this method will become general. Among sixty or seventy patients forty were subjected to bathing, and these the more ill. The attendants got into the habit of saying, 'It is the worst case which will recover,' so striking were the results. In my opinion cold baths, far from favoring the occurrence of intestinal hæmorrhage, constitute an excellent means of preventing it. It is the same with bronchitis, and I willingly affirm that the important groups of symptoms respond to this treatment in the following order: (1) broncho-pulmonary affections; (2) ataxic conditions; (3) intestinal hæmorrhages. I favor the treatment of typhoid cases in a ward by themselves. It is more convenient for this method."

Barth thought it was going too far to say cold baths prevented pneumonia. The author advocates the compulsory treatment of

typhoid fever in the army by this method, and cites the well-known reduction in mortality in the German army in its favor.

Appropos of the German military regulation in regard to this treatment, and to prevent hasty conclusions upon its value, Vögl recognizes the obvious objections to general orders in regard to treatment in a vast military organization, but points out the advantages of this plan as leading to the accumulation of a large experience and in overcoming individual prejudices on the part of military physicians.

On the other hand, Péter continues to oppose treatment by cold baths by the theoretical objections which he had already formulated in 1876 to 1883. As against the statistics showing the results of the cold-bath treatment, he opposes, on the one hand, those of the expectant method by showing a mortality of less than 10 per cent., and, on the other hand, those of the pretended methods of physicians who employ three or four tepid baths during the course of the day and report a death-rate of more than 15 per cent.

Ziemssen ¹⁶⁹_{Mar. Apr.} especially recommends the lukewarm bath gradually cooled. The patient sits in a bath of 87° to 92° F. (30.55° to 33.33° C.), and the water is kept in constant motion and splashed continuously on the parts out of water. It is to be cooled down about ten degrees by cold water poured on the patient's feet. The duration of the bath should be not under fifteen minutes nor over thirty. This form of bath is suited for most cases. The very cold baths Ziemssen condemns as causing too great shock, but he does use as low a temperature as 67° F. (19° C.), being guided by the fever and nervous disturbance. A warm bath Ziemssen has found very beneficial in the adynamic state. Of the use of antipyretics, strange to say, Ziemssen says nothing, barely referring to antipyrin as preferable to other antipyretics.

Glénard ¹⁴_{Feb. 20} gives the following outline of the technique of the treatment by cold baths. There are three kinds of baths applicable to the treatment of typhoid fever—the full cold bath, the half bath with affusion, and the full warm bath gradually cooled. Each of these may be employed in accordance with special indications:—

1. The full cold bath of a temperature of 18° to 20° C. (64.4° to 68° F.), and of the duration of fifteen minutes, into which the

patient is plunged up to his neck. This bath is stimulating and refrigerant. The indication for its employment is found in a great majority of cases.

2. The partial bath with affusions. The temperature of the bath is 28° C. (82.4° F.), duration from five to ten minutes. The patient is placed in it up to the nipples; the affusion consists in pouring upon the back and neck water of 10° C. (50° F.); after that he is briskly rubbed in the bath with a sponge or brush. This bath is stimulating, and is to be employed in typhoid fever of high temperature and where complications occur, especially the chest complications.

3. The warm bath gradually cooled, the temperature to be between 5° and 6° C. (9° and 10.8° F.) higher than that of the patient, the duration from twenty to thirty minutes. During this interval the bath is gradually cooled by the addition of ice or cold water until the temperature at the conclusion of the administration falls to 20° C. (68° F.). If shivering occur the patient is immediately taken out of the bath and placed in his bed, which has been previously warmed. This bath is refrigerant, but without stimulating influence. It is to be employed in cases in which there are affections of the heart, emphysema, etc.

Experience has shown that unfavorable results are avoided when the cases come under treatment before the fifth day. It is desirable for a physician, who is not personally familiar with the action of cold water in the treatment of typhoid fever, to commence by employing it in simple cases, especially in cases which come under treatment prior to the fifth day of the attack.

The following plan is that invariably to be employed under such circumstances: In a suspected case of typhoid fever seen at the beginning, the choice lies between a large dose of calomel and the treatment by cold baths, the preference being given to the latter if the presumption of typhoid fever is strong. If the diagnosis of typhoid fever is probable, recourse should be had to the baths, whatever may be the symptoms. The full tub should be placed in the ward or chamber, parallel to the bed at a distance of one or two metres, the floors properly protected by oil-cloth, and a screen placed between the bed and the bath-tub. A sufficient quantity of water should be used to cover the patient's body to the neck. It should be of a temperature of 18° to 20° C. (64.4° to 68° F.).

The baths should be prepared without disturbance or noise. There should be placed on the floor near the head of the full tub two pitchers of cold water of a temperature of 8° or 10° C. (46.4° to 50° F.), each containing four or five litres (quarts). A glass of water should be at hand. The first bath should be given preferably about four o'clock in the afternoon, unless there is some urgent reason for selecting a different hour, and the physician should be present. The rectal temperature is taken, the urine is voided, and the patient is assisted into the full tub, the screen having been removed. If there is perspiration the patient is dried before entering the bath. Cold water from the pitchers is poured upon the head and the back of the neck from a height of eight or ten centimetres (thirty-nine inches) for one or two minutes, the amount being from two to three litres (quarts). Then a swallow of cold water or red wine is given. This being done, the whole surface of the body is briskly rubbed with a sponge or brush. The patient is made to rub his abdomen and chest. These frictions stimulate the peripheral circulation, prevent the accumulation of heat at any one point, moderate the sensation of cold, and help to pass the time; they are not indispensable. Shivering appears, as a general rule, between eight and twelve minutes; this is a necessary evil to which too much attention is not to be paid. Toward the middle of the bath, or at its termination, cold water is again poured over the head and neck. The time occupied ought to be at least fifteen minutes, longer if the head is still warm and the cheeks red, or if the temperature of the patient has been very high before the bath.

The patient should leave the bath without precipitation; he cannot take cold. Thoracic complications are caused by typhoid fever and not by chilling. The air of the apartment should be pure and not too warm; the window should be opened in the interval of the baths; during the bath it ought to be closed. On leaving the bath, the patient should be lightly dried with a towel. The bed should be carefully made during each bath. If on returning to the bed shivering takes place, the limbs should be rubbed and a hot bottle placed at the foot of the bed. A cold compress, covered with oil-silk or flannel, should be placed over the abdomen, and a little warm nourishment administered.

Three-quarters of an hour after the bath the rectal tempera-

ture should again be taken. The general prescription for the administration is as follows: A bath of fifteen to twenty minutes every three hours day and night as often as the rectal temperature taken three hours after a bath reaches or passes 39° C. (102.2° F.). During the bath douche the head and neck three times, each time with two or three litres of water of a temperature of 10° C. (50° F.). A small quantity of nourishment is to be given after each bath, that is to say, every three hours. Alimentation should consist of the following articles: milk diluted with coffee or tea or cocoa (a quarter of a litre each time); gruel or oatmeal, tapioca, or vermicelli, thoroughly cooked; veal, mutton, or chicken broth, freed of fat when cold and re-heated at the moment of administration. As a drink, pure cold water; the indication for wine or spirits is only urgent in cases that are subjected to this treatment late in their course. If the patient does not sleep, or sleeps badly, he is to have a draught of iced water, and the abdominal compress is to be changed every quarter of an hour. The rectal temperature should be taken and recorded every three hours, before the bath, and forty-five minutes after each bath. If the temperature before the bath is below 39° C. (102.2° F.), the bath may be deferred until it again reaches 39° C., the temperature being then taken every hour. If it is found, however, to be below 38.5° C. (101° F.), it is not necessary to take it again for three hours. The discharges from the bowels are to be preserved for inspection, and the total quantity of urine collected in the same vessel. Neither age, sex, menstruation, pregnancy, nor sweating (except that which occurs at the end of defervescence) in any way modifies the treatment. In women who are weaning their children, cold compresses must be frequently renewed upon the breasts. If diarrhoea persist, it is to be combated by cold compresses, which may be kept cold by the aid of a bladder of ice. If there is constipation, it is to be treated by cold enemata, and, if this fail, by enemata consisting of one part of cold water and one part of fresh ox-gall.

When temperature before the bath is very high, or the fall forty-five minutes after the bath is less than 1° C. (1.8° F.), the bath must be prolonged to eighteen or twenty minutes. It is very rarely necessary to modify the general formula. When the temperature does not exceed 39° C. (102.2° F.) but yet reaches 38.5° C. (101° F.), it is necessary to treat this little exacerbation by baths of

20° C. (68° F.) and five minutes in order to prevent the prolongation of the fever or the occurrence of relapse, and to shorten convalescence. If relapse occur, it must be treated according to the general formula. When the temperature no longer exceeds 38.5° C. (101° F.), the defervescence is terminated, the baths are discontinued, and the patient ought to be treated as convalescent, but is to be kept in bed until for four days the temperature has not at any time exceeded 38° C. (100.4° F.). He may then rise and in a short time walk in the garden; he may prolong his promenades according to his strength, and one will be struck with the rapidity with which it augments with every outing. Proper precautions are to be taken against cold. As to alimentation, already during defervescence, when the temperature no longer reaches 40° C. (104° F.), there may be added to his soup, milk, or bouillon, either one or two raw eggs daily, or, a little later, one or two spoonfuls of scraped raw meat or a little toasted bread or biscuit; but the aliment must always be given as liquids.

The *régime* of the convalescence will be gradually established, and may consist of solid food, when for four days the temperature has not risen above 38° C. (100.4° F.). At this period the intervals between the meals will be at first three hours during the day; afterward add one meal daily; and a little later, morning and evening, the patient may have roast beef, fish, and bread in small quantities. The appetite is excellent, and it is necessary to control it. For two days in the convalescence the temperature is to be taken as before, after that, for a week, morning and evening. At the end of that time the temperature observations may be discontinued.

During the treatment by baths, one attendant is required for the day and one for the night; these duties may be fulfilled by members of the family. In a hospital one bath-tub may be made to do for a dozen patients, but it is better to use one for six patients. Two attendants are sufficient for twelve patients. It is not necessary to renew the water of the bath every three hours; once in twenty-four hours is sufficient. The patient treated from the beginning in this manner never suffers from faecal incontinence, and the rule is the patient should pass his water before entering the bath. In time of epidemic, the water of the bath if it is not soiled should serve for several patients, and should only be renewed two or three times a day.

Such is the treatment of typhoid fever by cold baths. When thus treated from the beginning, the malady is as monotonous for the physician as for the patient. Neither the one nor the other has misgivings concerning the cure, which comes to pass without incident after a number of baths varying from sixty to one hundred, and after a duration of the fever from seventeen to twenty-five or thirty days. If the duration be less than seventeen days, the fever must be regarded as having been a gastric fever. The advantage of the treatment consists in the reduction of the duration of the disease to its minimum, and in doing away with the convalescence, which is often so prolonged.

Chéron,¹⁰⁰ likewise gives detailed directions for the administration of the baths, and concludes a most carefully worked up article with the wish that the readers may be induced to experiment with the method of Brand without neglecting in any respect the directions laid down. His conviction is that success will crown their efforts.

Bouveret,²¹¹ gives statistics of typhoid cases treated at the Hôpital de la Croix Rousse in accordance with the method of Brand, showing sixty-one cases with three deaths,—a mortality of 4.91 per cent.

Krütchek-Golüboff,²⁵ with a view of illustrating the cardinal question of certain minor points as to the influence of prolonged tepid baths in enteric fever, carried out ten experiments on seven persons, five of whom were suffering from typhoid fever, while two were healthy. These individuals varied from twenty-one to twenty-six years of age and consisted of soldiers and hospital attendants. The observations were conducted in the hydro-therapeutic wards of the Clinical Military Hospital at St. Petersburg, where there exists a special bath measuring two hundred by ninety-two by seventy-one centimetres, and supplied with a movable bed consisting of a zinc frame with water-proof hemp net-work. Each observation was divided into three periods, viz. :—

(a) The pre-bath period of one and one-quarter to six and one-half hours' duration; (b) the bath period; (c) the after-bath period of one to seven hours' duration.

A. *Experiments on the Healthy Subjects.*—The duration of the bath was twenty-four hours fifteen minutes in one man, and twenty-four hours in another; the average duration of the whole

observation thirty-two hours fifty-five minutes; the average temperature of the bath 27.5° R. (93.87° F.) in one and 27.9° R. (94.77° F.) in another case, with the maximal level at 30° R. (99.5° F.), and the minimal at 26.4° R. (91.4° F.).

B. *Experiments on the Typhoid Patients.*—The average duration of the bath was fifteen hours forty-two and a half minutes, the maximal forty-three hours forty minutes, the minimal five hours; the average duration of the whole observation twenty-two hours ten minutes, the average temperature of the bath 27.2° R. (93.2° F.), the maximal 31° R. (101.75° F.), and the minimal 23° R. (83.75° F.). The experiments were made on the fifth, seventh (two cases), tenth, eighteenth, nineteenth, twenty-third, and twenty-sixth day of the disease.

C. The conclusions are as follow: 1. Prolonged tepid baths produce a highly beneficial action on patients suffering from enteric fever, since they powerfully lower the temperature, and the frequency of the pulse and respiration. 2. They entirely change the temperature curve, restoring its physiological aspect and favoring the appearance of remissions. 3. The greatest decrease of a febrile temperature is observed on the second and third weeks of the disease, and that especially in comparatively badly nourished (meagre) subjects. 4. The amount of defervescence is not always proportionate to the duration of the bath. 5. In morbid cases the after-bath fall of the temperature lasts longer than in the healthy persons. 6. The baths diminish ordinary daily losses in the typhoid patient's weight. 7. The manual muscular strength in typhoid cases increases. 8. Appetite, sleep, bronchial catarrh, and state of the tongue are markedly improved. 9. The gastro-intestinal and renal actions are restored to their healthy state. 10. The so-called "typhoid" phenomena, however intense, disappear, or, at least, are strikingly alleviated. 11. The baths do not produce any untoward (macerating) influence on the skin. On the contrary, the integuments become more elastic and fresher after a prolonged immersion. 12. A thoroughly good or comfortable subjective feeling experienced by the patient during the immersion is one of the most essential indications in regard to the duration of the bath in individual cases. This feeling of comfort must be kept all through by means of regulating the temperature of the water with utmost attention and care. 13. The influence of the baths under consid-

eration on typhoid fever is different from that on typhus or relapsing fever. It would be a bit of useful work to undertake comparative experiments on the antipyretic effects of tepid baths of various duration in the latter affections, as well as at various periods of enteric fever.

Love⁶¹_{May 1} has used with favorable results the gradually cooled bath. He recommends that the temperature of the water at first be about the same as that of the patient, then gradually reduced down to 85° F. (29.44° C.), or 80° F. (26.66° C.). The bath may be prolonged five or ten minutes.

Paul Chéron¹⁷_{May 24} has critically reviewed the discussion concerning the treatment of enteric fever in the Medical Society at Lyons. He concludes by citing the statistics collected by Glénard. Brand published a *résumé*¹¹⁶_{p. 44} of one thousand two hundred and eleven cases from family practice, from military hospitals, and the German Polyclinic, in all of which the method was used from the beginning. There were twelve deaths, that is, about 1 per cent. From these twelve fatal cases two should be eliminated, in one of them the treatment having been suspended upon the sixteenth day on account of arthritis, and the other terminating fatally from some unknown cause, probably due to relapse.

Brand recapitulates his statistics in the following manner:—

Cases treated in family practice—death rate,	0 to 1 per cent.
Military hospitals,	3 to 4 “
Consultation cases,	3 to 4 “
Civil hospital,	5 “

At Lyons, the Hôpital de la Croix Rousse gives 5 per cent. without eliminations, 1887; at l'Hôtel-Dieu, the figures are higher because the internes transfer all the grave cases to the service of Vinay, where they know they will be treated, and where the hygienic surroundings are very bad.

The expectant method gives 20 per cent. of pulmonary complications with a mortality of 50 per cent.; that of Brand gives 7.1 per cent. with a mortality of 35.7 per cent. One hundred cases of death under the treatment by baths shows 26.3 per cent. of thoracic complications, one hundred cases under other treatment 52.6 per cent.

The author concludes in quoting the words by which Glénard closed the discussion: 1. The method of treatment of typhoid fever by cold baths, tested for fifteen years at Lyons, has to-day

reached its full development. It has kept all its promises. Comparison with rival methods has each time been the occasion of new triumph for the method of cold baths. The great principle of its specificity, that is to say, of its systematic application to all the cases from the beginning has been adopted at Lyons. 2. The Society of Medical Sciences confesses the method of cold baths a sure criterion by which to estimate the value of new methods of medication which have been presented to it. The following law once again verifies itself, that the obituary curve in hospitals of Lyons oscillates in direct ratio with the consumption of antithermic medicines and in inverse ratio to the number of cold baths administered.

Drochon²²⁵_{Aug. 1} reviewed the statistics of various methods of treating typhoid fever. He finds that: 1. By former methods the mortality is about 17.45 per cent., but Jaccoud, basing his estimate upon eighty thousand one hundred and forty-nine cases collected from all sources, places the mortality at about 19.23 per cent. 2. The expectant method. Jaccoud, 11 per cent.; Péter, about the same, 10.2 per cent. In 1882-83, about the same; in 1882-83 he had one hundred and twenty-seven cases with fifteen deaths, a mortality of 10.2 per cent. Dujardin-Beaumetz, 12 per cent.; Bouchard, 15 per cent. Finally, Drochon has collected from the records of the Paris Hospitals, three thousand two hundred and forty cases with four hundred and five deaths, or about 12.5 per cent. 3. The method of Brand, six thousand one hundred and eighty-five cases with three hundred and fourteen deaths, a mortality of 5.1 per cent. 4. Mixed methods. In seven hundred and eight cases the mortality was 9 per cent.

Péter,¹⁴_{Mar. 25, Apr. 1, 11, 28} in a series of lectures upon treatment, discusses the various methods. He declares that the typhoid fever seen in the early days of his medical life, in the time of Chomal and Louis, is no longer encountered. The excessive tympany, the baked tongue, the fuliginous nostrils, have disappeared, together with the noisy delirium and the incessant agitation. The typhoid fever of our days is much less grave than that of former times, or, in other terms, the grave clinical forms are less common. He attributes this change to the improved health of the people in consequence of better hygienic conditions, and insists upon it that the infection is always the same and that the change has taken place in the subject.

1. The expectant method. The living organism tends spontaneously to disembarass itself from infectious substances; in other words, the natural tendency is to recover from accidental acute maladies, the infecting principle and the products of infection being eliminated by the urine, by sweating with or without eruptions, and by hæmorrhages. Thus the intestines, the liver, the kidneys, and the skin are the organs of elimination. The rôle of the physician is to observe the evolution of the morbid phenomena and to know how to hold his hand when this evolution is regular; for example, in the eruptive diseases, where the organism tends to throw off the specific infection spontaneously by cutaneous crisis, to which is given the name of eruption. In the milder forms of typhoid fever nothing is to be done. One should observe the dictates of common sense and follow the example instinctively set by the patient; therefore rest is to be advised, a prescription which the patient takes the more readily seeing that he usually has of his own accord betaken himself to bed. The diet is to be regulated—an easy matter in view of the presence of anorexia. Plentiful drink is to be given, which is more easy on account of the intensity of the thirst. The details of dietetics are well recognized. As to medicines, the patient may from time to time, at intervals of two or three days, with the view of facilitating the elimination, modifying the secreting surfaces, and cleansing the Augean stables, take a slight laxative, as, for example, a glass of eau de Seidlitz; and the administration once or twice a day of an enema of cold water (*mais non phéniqué, grand Dieu!*) should never be omitted. In such mild cases he does not even recommend the sulphate of quinia, so valuable in other forms. But should the expectant method be the exclusive treatment for typhoid fever? By no means. Systematic expectancy applied to all the cases of typhoid fever is injurious and unreasonable, just as would be any form of systematic medication, but it is the least objectionable of all the systematic medications, because in doing the patient no harm we at least give him the chance to get well spontaneously—if he can. And this is not the case with certain other forms of treatment of typhoid fever.

2. The various forms of systematic treatment. The author at this point says: “Every exclusively systematic treatment is bad because it is irrational. It is addressed, in fact, to a meta-

physical abstraction, to a creature of the fancy, a *disease*. *La dothientérie* is a schematic abstraction; but *le dothientérique* is a living reality. In the patient we have to do with an affection realized, individualized, that is to say, with an organism which seeks to expel the infection if it can and as it can. Thus, in a light case the patient is kept in a proper temperature, tepid enemata of light laxatives are administered, cut cups are applied to the thorax when a bronchitis arises as a complication, and thus, in consequence of a vigilant expectancy, the patient recovers. But the physicians given to systems treat their cases differently. They, supposing themselves to be inspired by the materiality of facts, are in fact pure metaphysicians, metaphysicians without being aware of it."

After reviewing in his own way (at once amusing and instructive to the student of medical history) the general subject of antipyretic treatment, both by means of the external application of cold in its various forms and the internal administration of refrigerant, or, as Péter is pleased to call them, toxic medicines, he goes on to say: "The systematic medication of the older physicians had at least as excuse a rational pretext, but the antipyretic medication has not even this pretext; it is eminently irrational. The hyperthermia of antipyretic physicians is not the cause of the accidents of the disease; it is not even the cause of the nervous phenomena, the delirium, etc., nor the cause of the digestive disturbances, the phlegmasias, or the hæmorrhages which may occur in the course of the disease. It is, therefore, useless to combat it."

To these publications Juhel-Rénoy¹⁴_{Apr. 16} and Mollière¹⁴_{Apr. 22} reply, quoting accurately not only the figures of Brand, but the experiences of the Lyons school, in support of the treatment of cold baths.

MEDICINAL TREATMENT.

On the other hand, Dujardin-Beaumetz¹⁴_{Feb. 2} declares himself a settled partisan of the treatment of typhoid fever by that form of symptomatic medication to which he has given the name of "armed expectancy," and which has also been described under the name of "the medication of indications."

Woodbridge⁶¹_{June} discussed the abortive treatment of typhoid fever in a well-considered paper read before the American Medical Association at its meeting in May. He holds that a therapeusis

based upon the germ theory must, in view of our present imperfect knowledge, set before itself *two* aims: (1) to destroy the germs of the disease, or arrest their development; (2) to combat the ptomaines which are developed during its course.

We consider first the conflict with germs. This conflict we may well believe must be conducted on two fields: (1) on the surface of mucous membranes with germs that have not yet entered the tissues; (2) in the tissues with germs that have gained access to them.

To the question, Would intestinal antiseptics be useful if we could effect it? we may find an affirmative answer in the following facts: (a) even in health, a considerable portion of faecal matter consists of micrococci and microbacteria, and that poisonous ptomaines are developed as a result of their activity; (b) the effect of Nature's disinfectant fluid in the intestine, viz.: the bile, and its apparent effect in restraining development of the germ in the upper portion of the small intestine; (c) the results of clinical experience.

There are three periods in the disease during which we may address ourselves to germicidal, and so abortive, treatment of the disease: (1) while germs are limited to contents of the intestinal tract; (2) after they have gained access to the lymph structure of the intestine and mesentery, but while the blood is yet able to dispose of all the germs thrown into it from the glands; (3) after the production of germs has passed the limit of the blood's power to destroy them, and there occurs a general infection of the body.

His main points of treatment are as follow:—

The digestive tract receives antiseptic attention throughout.

Frequent use of an antiseptic mouth-wash, generally Dobell's solution with listerine added. To this antiseptic wash is added occasional doses of one one-hundredth of a grain (0.00066 gramme) of hydrarg. iodid. rubr. in 1 per cent. trituration with sugar—this to be used three to six times a day, allowed to melt on the tongue, and no fluid to be taken after it for several minutes. The antiseptic effect of this is doubtless felt in the mouth, œsophagus, stomach, and bowel. In order to avoid the danger of salivation this is not used after the second or third day, unless very infrequently.

The main dependence for intestinal antiseptics as far as the ileocæcal valve is sodium salicylate in doses of ten grains (0.65 gramme) every two to three hours, given either in capsules or compressed tablets.

His chief reliance from beginning to end of the disease for an antiseptic agent below the ilcoæcal valve is a daily large enema of an improvised decoction of chamomile flowers and borax. The nurse is instructed to add a small handful of chamomile flowers to three pints ($1\frac{1}{2}$ litres) of water, and allow it to simmer, without boiling, on the stove for one hour; then to strain it through cheese-cloth to remove any woody fibre that might prove irritating; add a teaspoonful of borax and administer as an enema, giving all that the patient can be persuaded to take. At the second or third using, if not from the outset, an adult will generally take all. Retention for a few minutes is not essential, but doubtless increases the beneficial effect. This paper is based upon brief reports of ten cases.

Clemens¹⁹⁸_{May} advocates the use of laxatives in the early period of enteric fever. He prefers castor-oil in combination with turpentine to other laxatives, and repeats it during the first week of the disease.

Pychowski,⁵²⁰_{No. 28; Oct. 20} in sixty cases of severe enteric fever, complicated with cerebral symptoms, departing from the supposition that the cerebral symptoms were caused by fæcal stagnation and decomposition, administered, three or four times daily, enemata made first of ordinary boiled water at the mean temperature, and, later on, of various antiseptic and deodorizing solutions. The results were invariably excellent. In a couple of days the stools lost their offensive odor, delirium lessened or ceased altogether, the excited patients became quiet, the apathetic cheerful, etc. The best effects were obtained from the rectal injection of a 3 per cent. solution of permanganate of potassa.

Legroux,¹⁴_{Nov. 17} has used the following treatment in a large series of cases and believes in it. To all cases a good dose of calomel is first given, then if diarrhœa is prominent:—

R Naphthol,

Bismuth, 5â gr. 40 (2.6 grammes).

Make ten powders and give one every hour in capsule or suspended in milk.

If less diarrhœa, naphthol alone in same dose.

If tendency to constipation:—

R Naphthol, gr. 40 (2.6 grammes).

Magnes. salicylat., gr. 40 (2.6 grammes).

Ten powders as before.

Legroux finds in this treatment numerous advantages, both local and general, as, *e.g.*, disinfection of stools, diminution of

meteorism, and believes it affects favorably the course of the disease.

Muselli¹⁸⁸_{Apr. 1} concludes a study of the dangers of hyperthermia and of some antipyretic medicines in typhoid fever as follows:

1. Hyperthermia (pyrexia) is a danger in typhoid fever by reason of its effects upon the intestine, the heart, and the entire organism.
2. The hydrotherapeutic methods employed expose the patient to grave dangers of sudden death, internal hæmorrhage, capillary bronchitis, especially when it is practiced under the form of cold baths after the method of Brand. When practiced under the form of tepid baths or cold or tepid lotions, its effect upon the temperature is extremely feeble.
3. Sulphate of quinia rapidly loses its antipyretic action, since at the end of some days the febrile temperature, depressed for a time, quickly regains its former height. Its action is uncertain even in massive doses. Finally, sulphate of quinia given in large doses produces disturbances of hearing and headache, which render its discontinuance necessary.
4. Salicylic acid has an uncertain antipyretic action; moreover, it increases the tendency to hæmorrhages, both epistaxis and intestinal bleeding.
5. Antipyrin lowers the temperature in a certain and methodical method. It enables us to modify the evolution of typhoid fever so that it runs its course with a moderate temperature without exposing the organism to any grave results. It is, therefore, the best of the antipyretic remedies.

Picot⁷⁰_{Oct.} emphasizes the fact that the prophylaxis of typhoid fever demands the absolute, complete, and instantaneous disinfection of the fæcal discharges of the patient. As a matter of fact, the fæcal matters alone contain the bacilli, and the complete destruction of the bacillus renders the contamination of potable waters and of the surrounding air impossible. Reviewing the experimental investigations of Seitz and Chantemesse and Widal in regard to the various disinfectants in common use, he concludes that the chlorinated lime is the most efficient for the disinfection of fæcal matter. Drinking-water should be sterilized by boiling. He considers an antiparasitic treatment to be rational in view of our present knowledge of the biology of the bacillus typhosus. At present we are unable to jugulate the disease, but efforts to oppose it through pullulation of the microbe are reasonable. For this purpose he agrees with Péchollier in regarding the sulphate of

quinia as superior to thallin, kairin, or even salicylic acid and antipyrin.

Ellegood,¹⁹_{Sept. 15} in a paper on the germ theory of typhoid fever and its therapeutic indications, suggests that a national or international experimental commission be appointed to make investigations with a view of determining the cause and best method of treating typhoid fever, and that, in addition to the lower animals, human beings, prisoners condemned to death, be made the subjects of experiment.

Antifebrin.—Way,⁹_{Jan. 7} ascribes the cases of cardiac failure and collapse which have recently been reported to the improper and injudicious administration of the drug, *i.e.*, *from the administration of the toxic and not the medicinal dose of the drug.*

He claims for antifebrin, over all other antipyretics in the management of the hyperpyrexia of enteric fever, the following advantages:—

1. The size of the dose is small, and from the bland and unirritating character of the drug is easy of administration and not liable to produce gastric irritation. 2. The happy effect of the drug in reducing hypernormal temperature and in rendering the patient more comfortable by its soothing effects on the erethitic state of the nervous system accompanying febrile processes. 3. The absolute safety of antifebrin when used in medicinal doses.

Smith,²¹³_{Apr.} says that the temperature is more or less reduced in all cases, the difference being not in all cases accounted for by the amount of the dose.

The rise after its use is not rapid, but it is more likely to be so after a large dose not repeated than after small doses given every six or eight hours. In one-half grain (0.032 gramme) doses to a child of one or two years it causes a fall of temperature of from two to three degrees. Antifebrin always relieves the violent frontal headache. After the first dose this symptom disappears, and if it does return it is not nearly so severe, and in many of his cases did not return at all. In adults he never gives more than three to five grains (0.19 to 0.32 gramme) to begin with, and this dose never produces collapse or cyanosis.

Lépine,³_{Dec. 21, 97} employs phenacetin, on account of its slight solubility, in cachets of 0.5 gramme (eight grains) to the number of six or eight in twenty-four hours. In these doses it has no noticeable

effect upon the heart, and produces neither cyanosis nor any other unfavorable phenomenon, except, perhaps, sweating.

Antipyretics.—F. T. Pasternatski⁶_{Aug. 11} brought together a number of statistics showing the effect of different methods of treating typhoid fever upon the frequency of relapses. According to his figures, relapses occurred more frequently under cold-water treatment than when indifferent or inactive drugs only were employed. Still more frequently did relapses seem to occur when large doses of quinine—thirty grains (two grammes) per diem—were combined with the cold-water treatment. When large doses of antipyrin, thallin, and acetanilide were substituted for those of quinine, the results, as far as relapses were concerned, were even worse. There is, however, this to be said, that in Dr. Pasternatski's experience none of the relapses proved fatal, or, indeed, left any permanent ill effects.

Kalb and Bartlett²_{Jan. 2, '90} have treated a case of typhoid fever by the daily inunction of fifteen grains (one gramme) of mercury ointment for six days. In 80 per cent. of Kalb's cases the fever entirely disappeared within ten days.

Bartlett found that the temperature fell to normal in two or three days, and in five or six days all other symptoms had disappeared. The treatment is only of use when commenced before the ninth or tenth day of the disease. The diagnosis in all the cases is not positive.

J. C. Wilson¹¹⁸⁷_{v. 3} systematically treated five cases of enteric fever by means of hypodermic injections of calomel. The cases were all severe, and all recovered. Three of them ran an exceptionally favorable course. The author believes that calomel thus introduced into the organism exerts a decided therapeutic influence in ameliorating the symptoms and in modifying the temperature range in enteric fever.

Salicylates.—It will be remembered that a few years ago Desplats and Vulpian⁵⁰⁰_{Mar. 18; June 18}⁸⁰ strongly recommended salicylate of bismuth in abdominal typhus. They claimed that it not only acted as an antipyretic in this disease, but also as an antiseptic and an antidiarrhœic.

Jackson⁶¹_{Nov. '94} discusses the subject of the carbon compounds and their true place in the treatment of fevers, or the particular types of fever in which they are indicated, with especial reference to the employment of ammonium salicylate in typhoid fever.

He concludes that the carbon compounds generally are only indicated and could only be expected to be useful in those forms of fever which are due to a fermentative process caused by organisms exhaling carbonic acid gas, since they are chiefly destructive of this class of organisms and have little or no toxic effect upon those causing fevers which are accompanied by processes analogous to putrefaction in which ammonia or sulphuretted hydrogen are evolved, *e.g.*, typhus, typhoid, and the septicæmic fevers. It is in that form termed by Woodward "typho-malarial;" ammonium salicylate is especially effective, while in pure typhoid it is not.

Caffeine Subcutaneously.—Henri Huchard ²⁴_{Jan. 15} during the last four years has made frequent use of subcutaneous injections of caffeine in conditions of collapse, and finds them superior to ether inasmuch as they are less painful, more stimulant to the heart, and more diuretic. In cases where they are specially applicable the intestinal tract has generally become so incapable of absorption that as much as a drachm (four grammes) of sulphate of quinine will produce little effect if given by the mouth, and subcutaneous treatment is more desirable. The liquid he uses is a 25 per cent. solution of caffeine, along with an equal quantity of benzoate of sodium to help the solution and render it more painless.

Phosphorus.—Aycart ⁴⁴¹_{July, 87}, ¹⁹_{Apr. 81} recommends phosphorus both as a tonic and as a stimulant. He employs an ethereal solution containing one-third of a grain (0.02 gramme) of phosphorus to one fluidrachm (four grammes) of the vehicle, and prescribes this dose in two parts, taken daily in a glass of Malaga wine.

J. C. Wilson ⁶²_{Feb. 1} treats his cases in the Jefferson Hospital by calomel, seven and a half to ten grains (0.49 to 0.65 gramme), in combination with sodium bicarbonate, ten grains (0.65 grammes), at a single dose at night, to be repeated once or twice if the case is in its first week. If the case has reached the second week this dose is not repeated, and after the tenth day of the disease it is not administered at all, small doses of calomel being occasionally cautiously employed. Diarrhœa is not to be considered as a contra-indication to the use of the mercurial. If the evacuations are excessive suppositories containing one grain of aqueous extract of opium are used. Enemata of thin gruel may occasionally

be resorted to for the relief of constipation. Cold sponging of the body twice in twenty-four hours is employed. Carbolic acid, one grain (0.06 gramme), and tincture of iodine, two drops, are given from the beginning every two hours during the day, every three hours at night. Antipyrin, fifteen grains (one gramme), is given at a single dose when the temperature is over 104° F. (40° C.). Alcohol forms no necessary part of the treatment.

Gramshaw,⁶ employed carbolic acid in the treatment of enteric fever, in a mixture, of which this is the prescription:—

R Carbolic acid,	℥ 12 (0.78 gramme).
Tinct. iodine (B. P.),	℥ 16 (1.04 grammes).
Tinct. orange-peel,	3 1½ (5.9 grammes).
Simple syrup,	3 3 (11.7 grammes).
Water,	3 8 (249. grammes).

The dose should be an ounce every four hours for the first fortnight, or until the urgent symptoms yield, when the same dose is administered three times a day. The good effect is manifested almost immediately. In two days the pulse slows and gains in strength, the temperature falls, the tongue becomes moist, all diarrhœa ceases, and the general condition of the patient is so much improved that, as a rule, in a week all anxiety is at an end, and the case progresses quickly toward recovery.

He gives a "rough analysis" of one hundred and sixteen cases thus treated: Seventeen were children, ten adolescents, and the remaining eighty-nine adults, the sexes of the total number being about equally divided. They belonged to all ranks of life, and the surroundings of some of the poorer cases were not conducive to cleanliness or the possibility of good sanitary arrangements. *The result in every case but one has been complete recovery*, and that one fatal case calls for the explanation that death did not take place until long after the fever was over, and from quite an accidental and adventitious cause.

W. F. Waugh, of Philadelphia,¹⁹ in a paper on the "Specific Treatment of Typhoid Fever," spoke of his experience with sulphocarbonate of zinc in eight cases of undoubted typhoid fever, which led him to believe that this drug was of great value in this disease.

Ice-Bag.—Weichardt,⁸⁸ has employed an ice-bag wrapped in flannel and laid over the spleen in typhoid fever, and thinks that a

reduction of temperature and a hinderance in the development of bacilli resulted.

Alum.—Paoletti¹_{Apr.3} has treated sixty cases of typhoid fever, with excellent results, with crude alum alone. This drug had formerly been used only as a styptic and an astringent, but now that its antiseptic properties had been recognized it was clearly indicated as a remedy for abnormal fermentations in the intestinal canal.

Strophanthus.—According to Poulet,¹¹³_{Apr.22} and contrary to the existing supposition, strophanthus protects from hæmorrhage, and occasionally acts as a purgative. It exercises no especial influence upon the frequency of the pulse in typhoid. In the initial stage one or two grains in pill are markedly antipyretic.

Leidy⁸⁰_{Oct.16} says that in typhoid fever (1) *digitalis* reduces the pulse-rate, diminishes the respirations, and depresses the temperature; (2) that with a fall in the pulse and respirations there is a corresponding decline in the temperature; (3) that a weak heart is no contra-indication to its use; (4) that the main indication for its use is a weak heart, independent of hyperpyrexia; (5) that though a most powerful antipyretic in treatment of hyperpyrexia when associated with a weak heart, it should not be used to meet this indication when there are no evidences of cardiac weakness, i.e., when the pulse is strong, full, and bounding.

Jaccoud²⁴_{Mar.22} emphasizes the dangers of the employment of *sulphate of quinia* and of *salicylate of sodium* in the treatment of typhoid fever, pointing out the fact that among the seven recognized different forms of delirium which may be observed during the course of typhoid fever, there is one which it is most important to recognize and avoid, that is, the therapeutic delirium. This form may arise as a result of the administration of sulphate of quinia or salicylate of sodium in too large doses, or even with moderate doses if too long continued. These forms are: (1) initial delirium; (2) delirium of the period of development or typhoid delirium, properly so called; (3) delirium of inflammation, symptomatic of meningo-encephalic congestion; (4) alcohol delirium; (5) therapeutic delirium; (6) delirium of inanition at the time of defervescence; (7) late delirium, or the delirium of convalescence.

Jacobi⁵¹_{Dec.} points out the various sources of danger in typhoid fever in children, and reviews in a practical manner the best means of combating these dangers. The small intestine is affected prin-

cipally. After the first few days a considerable amount of food is required, and it must be so chosen as to be digestible in the stomach, its proper selection being the more important the more the latter organ is impaired by high temperatures. Besides plenty of water, or acidulated water (hydrochloric [no organic] acid), albuminoids are indicated. Milk and cereals (in decoctions, which must be strained) are the proper foods. The administration of stimulants, both as to quantity and to time, depends on the character of the individual case and the power of resistance on the part of the patient, besides the condition of the heart. At no time during the disease, and during the first ten days of fully established convalescence, must the food ever be solid. No vegetables must be allowed until three weeks have elapsed since the beginning of apyrexia. When the milk and cereal food become distasteful, a change in their preparation will and must suffice. The large majority of relapses are due to a dereliction in the strict rules of feeding.

TYPHUS FEVER.

Kartulis, of Alexandria, ⁶⁹ contributed a valuable paper concerning a form of fever occasionally prevalent in Egypt, and probably the same described by Griesinger in 1852. This fever, which has also been described under the name typhus-icterodes, was thought by Griesinger to be analogous to relapsing fever. With this disease, it appears, however, to have nothing in common. There is no constant relapse. Spirochæte spirillen are not found in the blood. It must be said, however, that cases of so-called bilious typhoid elsewhere observed, where spirillen have been present in the blood, are probably examples of true relapsing fever with jaundice. Kartulis had the opportunity, during nine years of treating more than one hundred and fifty cases of bilious typhoid, of which forty came to post-mortem examination. The disease, as observed by the author, presents certain points of differences from the descriptions of Griesinger, which may be set forth in parallel columns as follows:—

ACCORDING TO GRIESINGER.

A lemon-yellow icterus.
Yellow stools.
Pulse quick and regular.
Spleen invariably enlarged and altered.

ACCORDING TO KARTULIS.

Usually an orange-yellow icterus.
Usually clay-colored stools.
Pulse quick, often intermittent.
Spleen often normal.

Liver not often enlarged.	Liver invariably enlarged and tender.
Anuria absent.	Oliguria and anuria frequent.
Catarrhal or croupous inflammation of the ileum; dysentery of the large intestine.	Catarrhal inflammation of the small intestine, never croupous or dysenteric inflammation.
Croupous inflammation of the mucous membrane.	Absent.
Short in duration and cure of the disease from quinine.	No influence from quinine.

As regards the therapy, Kartulis found medication without result either in diminishing the mortality or influencing the course of the disease.

Diamantopulos¹¹³_{Apr. 20} states that the typhus icterodes of Smyrna is an endemic, rarely epidemic, disease of that city and its neighborhood. It is a general, acute, miasmatic, non-contagious affection—a disease *sui generis*, not identical with yellow fever nor the bilious typhoid of Griesinger, nor with bilious remittent fever. Its relationship to icterus gravis in many small epidemics cannot be positively affirmed. It does not, however, appear to be identical with that disease. Its etiology is obscure. Its geographical distribution in the Orient is not positively known. It probably prevails in many suburbs of Asia Minor and Egypt.

Horwitz¹⁰⁵_{May 15} published a condensed report of nineteen cases of typhus fever observed in an epidemic in the Philadelphia Hospital in 1883. Janovsky⁵⁷_{Aug. 13} gives an elaborate study of the exanthem of typhus fever which, however, presents nothing new.

MALARIAL FEVERS.

Etiology.—Numerous papers on the condition of the blood in malaria have appeared. Among the articles on this subject especially worthy of note are those of Evans,²_{Apr. 20} Shattuck,⁹⁹_{May 3} Denian,¹⁷_{July 7} James.⁵⁹_{Mar. 10} Baker⁶¹_{Nov. 10} regards it as proved, so far as evidence is yet presented, that intermittent fever is proportional, directly or inversely, to the average daily range of atmospheric temperature, and that the controlling cause of intermittent fever is exposure to unaccustomed changes in the atmospheric temperature.

Pathology.—Henry²_{Feb. 15} records a case of “quintan” ague in a female aged forty-six years. The symptoms were typical, cold, hot, and sweating stages being well marked. The temperature rose during the cold and hot stage, reaching 105° F. (40.55° C.), and fell during sweating stage, being normal during the intervals.

The spleen was slightly enlarged; the other organs were normal. The interesting feature of the case was the rare interval between the attacks, namely, four days. Moncorvo³⁵_{Aug. 22} has studied the asthma occurring as a result of malarial intoxication in children and gives details of several cases.

McBride¹³⁹_{July} has reported a case of periodical delirium from malaria in a child five years old. The child had eight or ten attacks of active delirium, with hallucinations of sight and hearing coincident with the malarial paroxysms. A perfect recovery was obtained under the use of quinine.

A. W. Reyes, of Sagua la Grande, Cuba,⁶_{May 12} in a paper on "Rare Forms of Pernicious Fevers," directs attention to the occasional sudden occurrence of intestinal occlusion due to violent tonic spasm of the intestinal muscular fibres, which is sometimes associated with spasm of voluntary muscles also. In these cases there is great difficulty in arriving at a correct diagnosis, for the temperature is usually only slightly above the normal, the extremely prostrate, sometimes cyanotic, condition of the patient coming on very suddenly, and there being nothing to point to the malarial origin of the affection. Nevertheless, the rapid and powerful effect of quinine, especially if administered hypodermically, together with the exhibition of some alcoholic stimulant by the mouth, is, he considers, a pretty sure indication of the true nature of these cases.

Bouchard³_{Oct. 4} reported the results of some researches recently conducted by Mosse in regard to the urinary excretion in intermittent fever. He found glycosuria present in two instances among one hundred patients suffering from malaria. Polyuria is, on the contrary, common, and lasts for some days after the febrile paroxysm. His conclusions are as follow: 1. The urology of malaria needs revision. 2. Glycosuria may occur after a case of intermittent fever, but it is rare and usually transitory. 3. Glycosuria occurring under these circumstances depends upon some inherent condition of the individual or special state of the organism, either transient or permanent, such as arthritic diathesis, lactation, etc. 4. Telluric intoxication plays only a secondary rôle in the production of glycosuria in malarial cases. It is as liable to follow mild and transient cases of malaria as pernicious cases. 5. After intermittent fever, there is commonly, but by no means constantly observed, an acute transitory polyuria, the quantity of urine varying

from two and one-half to three and one-half litres (quarts) in twenty-four hours; it may reach five or even eight litres. This polyuria is analogous to the polyuria which occurs after acute febrile diseases.

P. M. Gubareff, ⁶_{Nov. 10} of the Sebastopol Naval Hospital, reports an interesting case of diabetes following, and apparently due to, repeated attacks of malarial fever.

Juliano, ²²³_{Nov. 27} calls attention to the fact that paludism in individuals contracting venereal diseases is apt to produce, first, in the soft chancre, phagedena; second, in the blenorrhagia, gleet. Romanoff, of Vernyi, ¹⁰⁰_{Aug.} reports a case of rupture of the spleen in malarial fever. About two days after his admission into the hospital the man suddenly died, with all the signs of internal hæmorrhage. At the necropsy the anterior surface of the spleen was found to be traversed by a rent six centimetres long, while its external aspect was crossed in various directions with twenty ragged fissures, varying in length from one-half to two centimetres.

J. G. Carageorgiades, of Limassol, Cyprus, collaborator, has found clinically and anatomically that in Cyprus malarial fever never causes abscess in the liver; this is fully in accordance with the observation of Dr. Sangarolla, of Alexandria, as regards Egypt.

Sacchi ⁷⁵_{Nov. 15} arranges the paralyzes occurring in malarial diseases into three groups, as follows: 1. Paralyzes which occur during paroxysms of simple intermittent fever and vanish with the paroxysms, frequently recurring in succeeding paroxysms. Intelligence is undisturbed. Rather a rare form. 2. The paralyzes which occur in pernicious intermittent fever. They are associated with intense congestion and coma. They last throughout the attack and are prone to recur. Occasionally the congestion terminates in apoplexy. This is the most frequent form. 3. In rare cases paralyzes occur in cachectic conditions of chronic malaria without other appreciable cause.

Treatment.—Kenner ²²⁴_{Jan. 7} contributed an important paper on the treatment of intermittent fever. The various forms of intermittent may be classed in this order: 1. That which is attended with a high degree of "biliousness." Here the compound extract of colocynth combined with calomel, given when the patient comes first under observation, is an important adjunct to antipyretic treatment. 2. A second group includes the cases in which the

symptoms of "biliousness" are slight, or absent altogether. Quinine is here the specific. 3. A third group comprises the cases in which the paroxysms have continued to recur for a long time and a malarial cachexia is developed. The patients are those who have been exposed to the action of the malarial poison for a long period and have had paroxysms regularly every month. They are anæmic and usually have enlargement of the liver and spleen. Removal to a more healthful climate is imperative. The general health must be looked after. Cod-liver oil, arsenic, and iron yield the best results. 4. A fourth group includes those cases in which the paroxysms recur from habit. The patients have been exposed to the poison for a protracted period, usually without adequate treatment. Tonics are advisable, particularly iron, and iron in combination with arsenic. Agents that impress the nervous system are useful in resisting the paroxysm—cold baths or opium given before the expected chill have prevented its development. For the enlargement of the spleen, nothing is so good as tonics and the application of the ointment of the biniodide of mercury. The author alludes to the importance of the differential diagnosis of intermittent fever.

Pampoukis, of Athens, ⁷⁸_{J.M.}, states that new antipyretics, especially antipyrin and antifebrin, have been extensively used by the Greek physicians in malarial diseases with satisfactory results in shortening the duration and mitigating the intensity of the febrile stage. The author prefers antipyrin to acetanilide. On the other hand, Harley, ²⁰⁶_{J.M.}, who has employed the modern antipyretics in a large number of cases of remittent fever, regards antifebrin as superior to antipyrin, both in its greater power of reducing temperature and in the absence of after-effects.

Vogler ⁶²_{J.M.} recommends for the constipation in intermittent fever a powder consisting of calomel, four grains (0.23 gramme); ipecac, one grain (0.06 gramme); bicarbonate of soda, twenty-four grains (1.5 grammes); aromatic powder, twelve grains (0.77 gramme). Divide into twelve powders; give them as necessary. After the sweating stage is over he gives a pill of quinine, one and a half grains (0.98 gramme); capsicum, carbonate of iron, and nux vomica, each one-half grain (0.03 gramme); oil of cloves, *q. s.* Give one pill four or five times a day.

For the enlargement of the spleen he uses the biniodide of

mercury ointment, and rubs the abdomen with this every other day for about ten or twelve days, especially over the spleen.

Jacobi⁵¹ recommends quinine in the form of the neutral tannate, because it is tasteless and may be given in powder, but for one part of the sulphate two and a half of the neutral tannate must be administered. When it cannot otherwise be taken it may be given in the form of rectal injection. Acid is not here to be used, therefore very soluble preparations are employed, such as bromide, the muriate, the bisulphate, the carbamide. Suppositories are less effective. The applications of quinine ointment with lanoline or other fatty substances are not attended by very positive results. The carbamide may be given hypodermically. In the chronic forms arsenic is the principal remedy. The tincture of eucalyptus may be used. Ergot long continued constitutes the best remedy for splenic enlargement.

In the treatment of chronic malarial disorders, especially where nervous symptoms are prominent or anæmia is a serious factor, Solomon Solis-Cohen continues to derive the best results from the use of arsenic iodide, in doses of one twenty-fourth to one-twelfth of a grain (0.0027 to 0.005 gramme), three times daily. When there is distinct fever, or if muscular pains be present, he combines with it cinchonidine salicylate, three to five grains (0.19 to 0.32 gramme). When there is much splenic enlargement, or if the region of the spleen be painful, inunctions are ordered of iodine in lanoline and vaseline, thirty grains (two grammes) to the ounce, with ten to twenty drops of oil of gaultheria.

YELLOW FEVER.

Etiology.—In reply to the question, “Is yellow fever contagious?” Surgeon-General John B. Hamilton,¹¹⁸⁰ thus summarizes the existing facts: “Yellow fever is portable from place to place, is communicable to healthy persons, probably not by direct contact from the sick, but by the imbibition of specific germs. We might construct a reasonable hypothesis that it is feasible that the germs in sufficient number may be brought into the nasal air-passages of a person, thence to the fauces, thence washed into the stomach by the first drink of water, or swallowed with the saliva, the saliva itself furnishing a culture medium for the growth of the germ. We may conclude, then, having consideration solely to the fact

that yellow fever is a highly infectious disease of the mildly contagious variety, and is to be prevented by the adoption of such measures as will destroy the germ and thus prevent its propagation, and at the same time rendering sterile the soil or place whereon the germ shall fall." (?)

Sternberg, in an address delivered before the College of Physicians, Philadelphia, entitled "Investigations Relating to the Etiology and Prophylaxis of Yellow Fever," presented the results of his investigations of the method of inoculation practiced in Brazil and in Mexico, with the view of establishing in individuals protection against yellow fever. This address constitutes, in fact, a preliminary report. He states that researches made up to the present time have failed to demonstrate the constant presence of any micro-organism in the blood and tissue of those attacked. His own researches show that no such micro-organism as Freire, of Brazil, has described in his published works, or as he presented to Sternberg in his yellow-fever germ in the time of the latter's visit to Brazil, is found, as he asserted, in the blood and tissue of typical cases of yellow fever; that there is no satisfactory evidence that the method of inoculation practiced by Dr. Freire has any prophylactic value; that the claims of Carmona y Valle, of Mexico, to have discovered the specific cause of yellow fever have likewise no essential basis, and that he has failed to demonstrate the protective value of his proposed method of prophylaxis.

Sternberg examined blood from numerous cases drawn from the finger during life in the fresh condition, in preparations stained by various aniline colors, and by culture methods. He also studied with great care a large number of thin sections of the liver and kidneys, stained by the most approved method, from a considerable number of typical cases of yellow fever, without having encountered the *cryptococcus xanthogenicus*. He states that in certain cases micro-organisms have been found. The one to which most interest attaches is that described by Babès. This was discovered in 1884 in material sent to Paris from the laboratory of Lacerda in Rio Janeiro. He concludes that the question of yellow-fever etiology is still unsettled, and that it remains, in fact, just where it was left by the commission sent to Havana in 1879 by the National Board of Health.

Guitéras,¹¹⁹⁰ in a communication entitled "Some Observations

on the Natural History of Epidemics of Yellow Fever, Based on a Study of the Mortality Statistics of the City of Key West ; also, a Plea in Favor of a Continued Investigation of this Disease by the Government of the United States," says that all students of yellow fever will recognize that in the very beginning of its history we find the shadow of the malarial diseases as a source of difficulty and confusion. The time is past when it is necessary to prove that yellow fever and malaria are two distinct diseases, but we still have to contend against the imperfection of means of diagnosis, against preconceived opinions, negligence, ignorance, and even against dishonesty and political intrigue, to separate yellow fever from malaria.

He regards children as peculiarly susceptible, and concludes that the prevalence of yellow fever among the children of yellow-fever countries may not be considered as a matter of exception, but that, on the contrary, in early life there is a constant and special predisposition to the disease ; that it is a disorder essentially of white creole children. Amongst them is to be found its natural habitat, their infection being no matter of accident. The accidents, the abnormalities in the natural history of the disease, are really the migrations to foreign soil and the migration of the foreign element to the native soil. The new-comers, newly born or newly arrived, are the victims. For the natives it is a process of evolution, and they stand it better ; for the foreigners it is a revolution, awful and menacing, at the entrance to the loveliest gardens of the earth. The endemicity of the disease depends essentially upon the infantile and native population. By endemicity he means that the disease may recur after an interval at the same place without the necessity of importation from another locality.

The question of the spontaneous origin of disease should not be allowed to obscure this subject. He points out the fact that a focus of infection may for a time be entirely imperative because it is inaccessible. The cleaning out of a house, the opening of some old drain, may be the means of bringing into action the germ of the disease. The length of time that the poison may lie dormant in this manner has not been determined, but the farther removed such outbreaks are from the last epidemic the greater should be our suspicion that the cause of the outbreak should be looked for elsewhere. I am not convinced that such periods of absolute latency have ever extended much over one year.

Freire claims, with some show of reason, that Gibier's negative results should not weigh against his positive ones. Though Gibier did not succeed in isolating the yellow-fever germ found by Freire, others have met with better success, among the number being Rebourgeon, Finlay, and Delgado, at Havana; Rangé and Maurel, surgeons of the French Navy, besides a number of Brazilian physicians. Two of these—Finlay and Delgado—made their researches at the same time and place as Gibier and with the same care. To Dr. Sternberg he devotes but a foot-note, saying that the American sojourned but a short time in Brazil at a time when there was no epidemic. He examined but one sporadic case and made no autopsy; in fact, he had not the materials with which to form an opinion of even mediocre value.

Wall²⁰⁷_{Sept.} reiterates the opinion that the idea of yellow fever being only a more malignant grade of malarial fever is entertained by none but superficial observers. He dilates upon the difficulties of diagnosis at the commencement of epidemics and insists upon the fact that there are practically two types of the disease to be met with in an epidemic—one whose main feature is an acute parenchymatous nephritis, developed by the third day, and the other having no such complication and terminating with the first paroxysm of the fever, the patient being up and about as early as the fifth or sixth day.

In the graver type of cases with a nephritic trouble no line of treatment after the third day promises any certainty of success. So long as the quantity of albumen in the urine remains comparatively small and the kidneys continue to act tolerably freely there is encouraging hope of the patient's pulling through, though there are no means of telling when or how soon the action of the kidneys will become fatally impeded or suppressed and the case terminate in stupor, convulsions, and death, with or without black vomit toward the end. His observations are based upon one hundred and thirty cases treated by himself, in which the urine was tested, besides a large number of cases seen in consultation.

Timmermann⁸⁰_{Oct. 15} advocates the treatment of yellow fever by mercurials. He prefers the bichloride of mercury, and considers the hypodermic method of using it the only proper one in yellow fever and all other zymotic diseases, inasmuch as all germs or ferments that are productive of disease find their way into the human

body through two channels, viz.: through the air-passages and alimentary canal, whence they are absorbed and carried into the circulation.

Day¹² says that yellow fever should be managed without regard to the name, like any other malady presenting the same symptoms, the same lesions, and under similar conditions. He deems it a fortunate circumstance that in the history of his professional experience he conducted his first four cases of yellow fever to a successful termination, without really knowing that they were yellow fever. He holds that measures for relief must be promptly resorted to. If the skin is hot or dry, or dry without being hot, as is sometimes the case, the patient, being in bed, should be given a warm or hot mustard foot-bath under blankets to retain the vapor, supplemented by warm beverages, with a view of promoting diaphoresis. A laxative should be given in the beginning. He regards enemata of warm water with camphorated oil as preferable to castor-oil, or an infusion of senna-leaves with magnesium. If the attack begins with marked cerebral symptoms, such as profound unconsciousness or raving delirium, he recommends bleeding at the arm. If the tongue is deeply furred, the saliva thick, the right hypochondrium tender under pressure, the urine scanty, the eyes injected, the temperature high, respiration hurried, and there is pain in the head, back, and limbs, he prescribes twenty grains (1.3 grammes) of calomel, and thirty to forty grains (2 to 2.6 grammes) of quinine, divided into four equal parts, one dose every four hours. For nausea or irritability of the stomach a fly-blister is to be applied, with small doses of morphia and enemata of water and bicarbonate of soda. If a hæmorrhagic tendency display itself, or black vomit take place, the free use of the muriated tincture of iron with crushed ice and brandy, or champagne, is useful. If suppression of urine supervene, there is nothing better than dry cups over the kidneys and frequent frictions up and down the back with warm whisky, spirits of turpentine, and tincture of digitalis. Under this treatment he states that his death-rate has not exceeded three to three and a half per cent.

THERMIC FEVER (INSOLATION).

An interesting report is given of the thirty-one cases of heat fever treated at the Pennsylvania Hospital during the summer of

1887 by F. A. Packard,⁵ resident physician. In all cases the temperature was taken in the rectum. Usually at the outset from fifteen to twenty minims (1 to 1.3 grammes) of digitalis was administered hypodermically, and the thermometer removed every seven minutes in order to note the change in temperature. Patients were rubbed with ice and sprayed with ice-water constantly. It was found that if the icing were continued after the rectal temperature had fallen below 104° F. (40° C.) it was apt to be too rapid and great a fall. Where convulsions were present after the temperature had been lowered a considerable extent, morphia was used, usually with good effect. In these cases respiration and pulsation both improved in character with fall of temperature, but if they did not do so bleeding was employed in spite of feeble pulse, as it was almost invariably followed by a quiet and full respiration, with a full, steady pulse. Wherever there was evidence of obstructed venous circulation in the brain, bleeding was employed. After the withdrawal of blood from the median basilic vein to the extent of twelve to sixteen ounces (three hundred and seventy-three to four hundred and ninety-eight grammes), there was usually a marked improvement in circulation, respiration, and color, and in many cases complete or partial return of consciousness. All the thirty-one cases admitted at the hospital were white, fifteen were natives of Ireland, five of Germany, three of the United States, two of Scotland, two of England, and one each of Newfoundland, Switzerland, and Hungary. Fifteen were laborers. One curious fact was noted: a case reported was that of a waiter in a most comfortable club-room, without exposure to other causes than the warmth of the dining-room and his exertion at waiting (but he was a native of Switzerland, and had been but a short time in this country).

In regard to the alcoholic habit predisposing to this condition, accuracy was impossible. The greatest number of cases were admitted between noon and 6 P.M. In nineteen of the cases the heat predisposing the attack was solar, in eleven it was artificial, while in two both factors were at work. The highest temperature attained was 112° F. (44.4° C.), more of the cases having temperatures, upon reception, between 110° and 111° F. (43.3° to 43.9° C.) than between any other two degrees. Twenty of the cases were unconscious, eight were conscious, and three were partially conscious,

while four were wildly delirious. Consciousness was maintained in every case where the temperature was below 108° F. (42.2° C.), except in one where the temperature was 102.4° F. (39° C.). The pupils in twenty-four cases were extremely contracted, in five they were natural, in one they were sluggish, while in one only they were dilated. Where the pupils were contracted there was also present unconsciousness except in three cases, and in these the temperature was one hundred and six degrees or over. Convulsions occurred in but six cases. The pulse varied much in different cases, being invariably absent at the wrist, where the temperature reached 108° F. (42.2° C.). Respiration in almost all cases was accelerated. Color of the face varied from flushed in the lighter cases, to livid and mottled in the cases with marked alteration in respiration and circulation. Involuntary evacuation of liquid, offensive stools was present in many of the cases, with the typical mousy, repulsive odor characteristic of these discharges. The longest time required to reduce temperature to within safe limits was within one hour, the average time being from ten to fifteen minutes. The prognosis could be made easily from the facility with which the temperature was reduced. The mortality in the whole series was twelve out of thirty-one. The manner of death was, as a rule, by almost simultaneous cardiac and respiratory failure. Death might be stated to have been in most cases produced by the combination of the following causes: cerebral congestion, uræmia, marked alteration of the blood interfering with the due performance of its physiological functions, venous stagnation, respiratory and cardiac failure; the prime cause, of course, being excessive amount of body heat, the others depending partly upon it and partly upon each other, forming to a certain extent a vicious circle. The blood, probably, was first altered in composition, causing impaired nutritive capacity with a tendency to stagnation from its viscosity. The renal cavities became blocked up by the altered blood, thus cutting off the excretion of urea and its allies, which must have been formed in enormous quantity over and above that of health, from the rapid metamorphosis of tissue which it is reasonable to expect was occurring under the influence of the high temperature. Venous stagnation and vitiated blood, together with the changes in the cerebral tissue incident to the high temperature, produced the unconsciousness with the impairment of activity in the respiratory tract, while the

latter, with venous stagnation and cardiac weakness, caused interference with the respiratory function. Interference with the respiratory function again reacted upon both cerebrum and the heart. So, also, the heart, organically affected by the high temperature and functionally by the changes in other organs, kept the vicious circle revolving. Secretion of the skin was absent and the intestinal tract was greatly disturbed.

From the experience in the Pennsylvania Hospital, the essential points in the treatment of heat-stroke may be summarized as follows: Put patient in the shade where there can be as free a circulation of air as possible; strip him, and, if the temperature is above 106° F. (41.1° C.), apply ice to the body until temperature falls to 104° F. (40° C.), then dry patient and put him to bed with an ice-cap to his head. If convulsions occur at this time, use morphia; if the circulation and respiration do not improve with the fall in temperature, bleeding may be employed. In addition to these practical and easily remembered rules for the treatment of heat fever, we would remind our readers of a suggestion made by Morris J. Lewis,¹⁹ that the physician would do well to carry with him a watery solution of antipyrin, two drachms to half an ounce (7.8 to 15.5 grammes), and administer at once twenty drops hypodermically, in order to bring about an early fall in temperature before other means can well be effective. From the experience of several physicians⁶² it must be remarked that for the treatment of insolation (thermic fever) every ambulance should carry ice, sprinkler, and pail, and the patient should be treated on the spot until the ambulance surgeon feels it is safe to move him. It is essential to have patient's clothing removed, and it is best to take thermometric observations with the thermometer in the rectum. Wherever the cardiac action is depressed it is of the utmost importance to keep patient in a recumbent position. If the patient has a very high temperature, it is unwise to too rapidly reduce it. The thermometer in the rectum is the best for all treatment. The influence of a full dose of antipyrin in the reduction of excessive temperature in case of thermic fever is a very important item to know. Under no circumstances has its administration been attended with uncanny results. In every case it has seemed to play an important part in the primary reduction of temperature.

DENGUE.

Granby,⁶⁰ speaking of the treatment of dengue, states that the most successful treatment in his opinion has been ipecac and tartar emetic and antimony, followed up by antipyrin until the fever and pains have disappeared.

Our corresponding editor, Dr. Carageorgiades, of Cyprus, reports an epidemic of dengue on that island, the first that had occurred since he had been practicing there, over twenty years. The disease being endemic in Egypt, it had probably been communicated to Cyprus from that country.

VARIOLA.

Diagnosis—The Grisolle Sign.—At the onset of a papular eruption it is often difficult to decide whether the case is one of measles or small-pox. The following method is a certain means of determining by which of these diseases the eruption is produced. If, upon stretching a portion of the skin the papule becomes impalpable to the touch, the eruption is caused by measles; if, on the contrary, the papule is still felt when the skin is drawn out the eruption is the result of small-pox.¹⁴⁷ The only test we have or can have as to whether vaccination has properly taken or not, is a foveated and striated character of the cicatrix. The term vaccination is so frequently applied to the performance of the operation, irrespective of its results, that it becomes the duty of every vaccinator to examine the cicatrix to prove the genuineness and perfection of the operation. By observations made for many years in small-pox hospitals, it has been demonstrated that the extent to which small-pox is modified by vaccination is determined by the number and character of these cicatrices; that it is in exact ratio to the excellence and completeness of the vaccination, as determined by these tests. Persons who have but one genuine vesicle are less protected than those having two or three, and the protection of those having four or five is almost absolute. No size of cicatrix amounts to anything, as a small typical scar is much better evidence of protection than a large, smooth, and irregular one. That small-pox may occur after vaccination is generally conceded, but the degree of its severity will depend chiefly on the perfection of the protective means of infection of the system.¹⁰⁷

Amœba of Variola.—Van der Loeff¹⁰⁹ states that some matter taken from the pustules of confluent small-pox was placed in sterilized tubes, and on examination some hours afterward he found in it the same proteides or amœbæ that have hitherto been found in fresh vaccine lymph from animal sources. Subsequent preparations also showed the identity of the forms.

Small-Pox Among the Arabs.—Some curious details are embodied in a paper by M. A. Prengrueber, of Palestro,² on the spread of variola among the Kabyles, a native tribe of Algeria. They practiced inoculation by means of an incision between the thumb and the index finger, which not infrequently degenerates into an ulcerated wound, slow to heal, and giving rise to phlegmonous erysipelas. In one instance a native peddler, on his return from Algiers, developed symptoms of small-pox. Immediately the whole tribe rushed to his tent for the purpose of procuring the material for inoculation, and from this tribe as a starting point the disease rapidly spread among the neighboring tribes far and wide. Among a population of thirteen thousand seven hundred and sixty-three, seven hundred and ten cases of grave and confluent small-pox occurred, with ninety-four deaths, equivalent to 5.2 per cent. of the inhabitants and 13.2 per cent. of the cases. Dr. Prengrueber recommends compulsory vaccination.

Treatment—Use of Calomel for the Prevention of Pitting in Small-Pox.—Joseph Drzewiecki⁶⁹ states that calomel applied as a powder on the face does not prevent the development of vesicles from papules, but when vesicles or pustules are developed it causes them almost immediately to dry up, and in this manner prevents the formation of marks. How and why calomel acts in these cases is not definitely explained. However, we may suppose that possibly several agents have a share in producing this result. Perhaps the calomel acts partly as calomel, partly as corrosive sublimate, or partly, perhaps, as metallic mercury.

Acetanilide in Small-Pox.—Hermann Haas⁸⁸ states that the employment of this drug, which he used in doses of two grammes (thirty grains) daily, given in solution, a tablespoonful at a time, every hour from ten in the morning until nine o'clock at night, always reduces the temperature during the critical hours of the afternoon, from 1° to 2° C. (1.8° to 3.6° F.), and sometimes even down to the normal temperature, so that fever assumed the

inverse type; that it greatly relieves and lightens all the accompanying symptoms of the fever; that it acts as a nerve tonic and anæsthetic, relieving the patient from the miserable feeling of utter helplessness to which he is usually subjected. By means of its power to constantly reduce fever, it seems beneficially to influence the threatened degeneration of the parenchyma and strengthens the organism so that it can withstand the long-continued fever better. Its use is free from systematic disturbance. The chills, which several physicians have observed to follow the use of antifebrin only occurred in a few instances after very large doses. Anæmic patients are more subject to them than others.

Iodoform ointment, in the proportion of one part of iodoform to twenty parts of vaseline, is much vaunted by Colleville.⁴¹
p. 417, w The most marked advantage of this ointment is that it prevents the formation of scabs, the odor from which is often so penetrating and offensive. In one or two days at the latest the pustules collapse, and there remains no ulterior cicatrix.

Carbolic Acid Treatment of Small-Pox.—A recent epidemic of variola at Naples has induced Montefusco,⁵
p. 417, w to make trial of carbolic acid in the hospital Cotugno. The treatment consisted in the topical as well as internal use of carbolic acid. Local treatment consisted in the application made by mixing carbolic acid with oil and carbonate of lime, which was applied with compresses in confluent patches. He concludes, however, that this practice is no more effective in its results than in the usual water compresses. The internal use of the remedy, on the contrary, is found to be highly effective. It lessens the fever heat, and in most cases the temperature remains low. In a few instances a severe rigor preceded a new exacerbation of fever, but no untoward accidents occurred. An impression is made on the eruption also, which becomes smaller in extent, matures earlier, the period of suppuration is shortened, and the scab drying and falling off sooner than is usual.

Robin,¹⁰
Sept. 28 has lately made a very interesting communication to the Academy of Medicine on clinical urology of small-pox, a question which had never been treated in a very systematic manner. He is led to establish four varieties of albuminuria: 1. Prevariolic albuminuria, occurring before the eruption. It is grave when abundant. Only one case of the kind has ever been known.

2. Transitory albuminuria. This is a little marked and shows itself at the outset of the eruption and of suppuration. It is of no diagnostic or prognostic value. 3. Abundant albuminuria, coming on at any period of the acute stage. This is rare and of a grave prognosis. 4. Albuminuria of convalescence, which should be divided into two varieties. The first accompanies or precedes the febrile returns of convalescence, or a tardy complication—abscess, parotiditis, etc. It is transitory, not abundant, and without serious prognosis. The second is analogous to post-scarlatinal albuminuria and, like this, proceeds from a particular form of nephritis termed variolic nephritis.

WEIL'S DISEASE.

Fiedler ³²⁶ _{v. 42, p. 361; May} ⁵ concludes that Weil's disease, of which thirty cases have been so far reported, is not an abortive form of typhoid fever, as Weil has suggested. It is a distinct, acute, infectious, or toxic affection. The disease begins suddenly, without prodromal symptoms, but often with a chill. The constant symptoms are fever, headache, gastric disturbance, jaundice, and muscular pain, especially in the calves. The fever has a typical course, and lasts eight or ten days. Relapses have been observed. The spleen and liver are generally, but not always, swollen; the liver often becomes tender on pressure. Nephritis is often observed; herpes and erythema occur at times. The prognosis is generally favorable. Weil's disease is generally seen in hot weather, and men in the prime of life are the most subject to it. The cause is quite unknown, but butchers appear most liable to the disease, judging from the scanty statistics already at the disposal of the physicians who have studied Weil's disease.

BRASS-WORKER'S FEVER.

Simon ² _{Apr. 28} published an essay on "Brass-Worker's Diseases," and especially the so-called ague of brass-workers. He found, on inquiry among those who have suffered from this disease, that the sequences of cold, hot, and sweating stages were never present, and that there is no relationship with malarial ague. He thinks the symptoms such as would be caused by ingestion of a quantity of irritating metal sufficiently large to cause vomiting and its attendant depression. He thinks the name "brass-worker's ague" should not be continued, as being wrongly suggestive and misleading.

SCARLET FEVER, MEASLES, AND RÖTHELN.

By LOUIS STARR, M.D.,

AND

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PHILADELPHIA.

SCARLET FEVER.

Etiology.—Adams ⁶_{July 14} has known the disease to be communicated by a convalescent who retained no obvious signs of ill-health or infection as late as the forty-third day; and, in his opinion, the infection has in such cases been communicated by the act of kissing. It is well, therefore, to make it a rule to maintain isolation for a minimum period of seven weeks, and even then to give a caution against the habit of kissing. The retention of infection about the fauces for prolonged periods is well known in the case of diphtheria, and it is possibly, at times, the same in scarlatina, even when no obvious indications of any throat affection remain.

There are, however, cases in which patients returning from the hospital have been credited with conveying the infection, when it is much more likely that the mischief has been induced by the bringing out of clothing which the patient wore a few days before being isolated and which escaped disinfection.

J. Brooke, of the U. S. Army, ⁵⁹_{Aug. 4} reports the following very interesting case: Girl eight years of age was attacked by scarlet fever, the disease running a typical course. For a long time no possible source of contagion could be discovered. The child had not been absent from home, had been with no one lately exposed, and no other case was known to exist anywhere in the vicinity. Subsequently the author learned that one of the house-servants had nursed a case of scarlet fever in a distant city just about a year before. After the case terminated she packed some of her effects, including some clothing then worn, in a trunk, and left the place. A year later she had the trunk brought to her new place, opened it, and took out the contents, the child being present and handling the things. Very soon after the latter was attacked.

The London *Lancet* Committee regard the period of contagiousness as running from the first appearance of the rash to the date when all *roughness of the heels and ankles* has disappeared. This time was found to be as follows for the four years from 1878 to 1882: in one year the average number of days was fifty-four, in two years seventy, and in one year seventy-four. Blodgett⁹⁹_{Apr. 26} thinks that public-library books are a great source of contagion.

Whitelegge⁶_{May 26} details an analysis of upward of six thousand cases, showing that the liability to scarlet fever is slight in infancy, reaches its maximum in the fourth or fifth year, and diminishes every year afterward. The severity of attack, however, is greatest in the first two years of life, and lessens year by year throughout childhood and adolescence. In adult life there is apparently a slight increase again, but the accuracy of this statement is open to question.

Females are more liable to attack than males at all ages after infancy, and especially between twenty and twenty-five years, when the charge of children gives special facilities for infection; but the attacks among males, though fewer, are more fatal.

The scarlet fever death-rate reaches its maximum in both sexes in the third year of life: 42 per cent. of the cases and 65 per cent. of the deaths occurring in the first five years of life; 40 and 26 per cent. respectively in the second quinquennium; and $11\frac{1}{2}$ and 5 in the third. The advantage of postponing an attack is two-fold, each year of age beyond the fifth diminishing the liability to and the postponement lessening the severity of the attack. Probably two-thirds of the adult population have escaped altogether.

As regarded season, the maximum of cases and of deaths occur in October, the minimum in April. A scanty rainfall seems to be favorable to the spread of the disease. Besides the annual or seasonal curve, a weekly curve may be constructed showing the number of attacks upon each day of the week. The result of this experiment in regard to eleven hundred cases in Nottingham was to indicate a marked reduction in the number of attacks on Wednesday, presumably due to less facility for infection on Sunday.

Diphtheria and enteric fever are now known to be affected by other influences than the accident of exposure to contact with previously infected persons. Scarlet fever has many points of re-

semblance to these two diseases, notably in its seasonal curve, and in this and other respects is in strong contrast to the typical infectious diseases, such as small-pox, whooping-cough, and measles.

Infection from a previous case is the obvious explanation of many attacks of scarlet fever, and may be true of all or almost all, but it cannot be the whole truth. Some further explanation is needed to account for the well-marked seasonal and other variations in the prevalence of the disease.

Symptomatology.—Squire¹⁵ says that in all widely spread epidemics of scarlet fever many anomalous cases worthy of notice usually occur. A record of these may serve to put us on our guard against insidious forms of the disease and to clear up doubtful points in the history of epidemics. The following cases deal with the question of relapse or re-infection, and have some bearing on the Hendon epidemic of 1885; they also throw light on a remarkable epidemic in France during the spring and summer of 1887. This last occurrence merits special mention, as otherwise likely to pass unrecognized under the names given to it by Brouardel,³⁰⁰ of “rubeoloid miliary sweat” (*suette miliare du Poitou*).

In the summer of 1881, a nurse, said to have previously had scarlet fever, living in a family having three children, had sore throat with a patch on one tonsil; she had visited at a friend's house where some children were ill. Three days afterward another nurse in the same house, aged fifty-five, who had never had scarlet fever, became ill. The youngest child, a boy aged five years, slept in the same room, and he became suddenly febrile at night, and was removed to a bed-room occupied by his grandmother, aged sixty-five. The next morning a fine rash or suffusion of the skin was noticed for a short time and then disappeared entirely, the child remaining in bed. The two elder children then had sore throats, and the eldest, a girl, had well-marked rash. Meanwhile, the grandmother, who had had scarlet fever in early childhood, suddenly had rigor and sore throat, with a rash on the face and neck and swelling of the eyelids. Her illness was at first thought to be facial erysipelas, but subsequent desquamation, occurring also—in large flakes—from the hands and fingers, left no doubt as to the full development of a second attack of scarlet fever, contracted sixty years after the first. The old nurse was confined to her bed with scarlatinal rheumatism, and also had desquamation in large

flakes—*doigts de gant*—even the nails being detached. Desquamation was very marked in the youngest boy, who had so little rash, and was freer and more continuous than in the older children.

Four and a half years afterward the youngest boy had a second attack, which lasted some seven or eight days and was followed by slight desquamation. The elder brother and sister, who had had a less doubtful first attack, were often in the sick-room after the first day of the illness. They had some sore throat, the girl having both tonsils enlarged, smooth, and red, with the cervical glands palpable, and those at angle of jaw tender, and a temperature of one hundred degrees. The temperature fell next day to normal, and the glands in the neck, though readily felt, were no longer tender. In the week following some neuralgic pain in the left leg was complained of, but there was no further illness, outdoor exercise being enjoyed, and early association with other children resulting in no extension of the disease.

These cases clearly show that second attacks of scarlet fever are less severe and of shorter duration than first attacks and that infection from them is sooner over. Relapses, on the other hand, are often, though not always, more severe than the original seizure, and the infectious period is prolonged to its full extent.

The author reports the following cases of relapse:—

“Child, aged four, eldest in the family of three girls, has congestion of the right pulmonary base and marked icteric tinge; temperature, 103° (39.46° C.). The illness began suddenly one week before with difficulty of swallowing, slight cough, and some coryza on the first day; next day the conjunctivæ were more suffused, the face flushed, and a fine rash was observed on the body, which was fading and had assumed a yellowish color on the seventh day, when the severer chest symptoms began. The urine contained no albumen, but was scanty and high-colored. At this time the two younger children were suddenly taken ill, the elder with a rigor, both with cough, and the youngest with bronchial râles. Next day the elder had redness and swelling of the face, and by evening both had a rash which lasted three days.

“These two children were nursed apart from the eldest sister. Their illness was slight compared with hers, and they were soon about again; they did not go out-of-doors till three weeks from the day they were first ill. The second girl, the elder of the two,

seemed languid after returning from a walk ; she could not eat, complained of her throat, and of feeling chilly ; in the evening she had a warm bath, and next day a rash appeared on the chest and back ; temperature, one hundred and two ; she seemed more ill than in the first attack. The rash extended to the face and limbs ; it faded away after three days, and was followed by desquamation in raised edges of cuticle on the back and sides of the body ; no marked desquamation of hands and feet.

“ Meanwhile, the eldest had well-marked desquamation, the tongue remained bare and red for some time, and her convalescence was slow. In the sixth week of it, when she began to gain flesh and strength, large flakes of epidermis separated from the hands and feet.”

The question of relapse or re-infection is one of some importance not yet settled with the precision it demands. An author¹⁰⁶⁷ states that “ a recrudescence or relapse is possible as late as the fourth week ; this, if not a re-infection, prolongs the duration of the infectious period.” He further states that such relapses often exceed in severity the original seizure, and is disposed to concede the possibility of a recurrence up to or beyond the sixth week of convalescence.

The following are a few cases of this kind that have come under his observation :—

“ Robust girl, aged four and one-half years, was seized with scarlet fever on July 12, 1886. The rash continued to the 15th or 16th and desquamation began early and continued to August 9th, when she was received at a home for scarlet fever convalescents. Ten days afterward, five weeks from the first attack, she became suddenly ill, with vomiting at 5 A.M., sore throat, and rash by evening ; temperature, 103° (39.46° C.); desquamation began again on the tenth day ; the convalescence was tedious and marked by greater depression than before.

“ Child, aged five years, taken suddenly ill on June 30th, 1887, the rash of scarlet fever appearing on July 1st. Free desquamation followed and continued to the end of fifth week. August 26th child became restless and febrile ; next day sore throat and rash appeared ; temperature, 101° (38.33° C.); on the 28th the temperature was 103° (39.46° C.); pulse, 120 ; respiration 30 ; rash over chest, neck, and back ; it was less uniform in the

limbs, with spots only on the hands and feet; throat angry, with small ulcer on left tonsil. August 29th, full rash; throat better; temperature, 102° (38.88° C.); pulse, 130; two days later the throat became well. Desquamation was first noticed September 9th. It continued to the end of the month, when a little roughness could be found on the fingers and hands after rubbing."

In this case fully three months passed from the original attack before infection could be considered to be at an end.

Another anomaly that the author has met with more than once is perspiration during the ingress in place of the dry heat of skin usually present.

The first case seen by the writer was that of a boy, the accident occurring during the eruptive stage; he had had a hot bath the evening before on the sudden ingress of suspicious symptoms. A younger brother remained at home, and a few days after had similar symptoms, and, though no hot bath was given, perspiration accompanied the eruptive period.

Another instance is that of two well-grown boys. One evening the elder, a medical student, became suddenly ill; he perspired profusely in the night, and remained next day in bed with sore throat, fever, rash, and perspiration. The last symptom continued during well-marked scarlatinal eruption; small raised spots of epithelium and dried exudation were soon left on the face and chin, and sudamina formed on the chest amidst the scarlatinal rash. The younger brother was kept at home, and, shortly afterward, symptoms of scarlet fever began in him, also with perspiration.

None of these cases were of great severity, and no infection was spread from them. Albumen was not found in any of the anomalous cases, although looked for carefully in all stages of the illness.

Corminas,⁹ reports the case of a girl, nine years of age, who suffered from very great enlargement of the tonsils, which had been increasing for some years. She was attacked by scarlet fever, which was accompanied by an alarming amount of throat trouble. On the fourth day it was found that the tonsillar enlargement had entirely disappeared. The patient made a good recovery. Here the scarlatinal process produced a more complete cure than caustic or removal by the knife could have done,

the fossæ behind the pillars of the fauces appearing perfectly normal.

Complications.—Jackson⁹⁹ reports fifty cases of scarlet fever, thirty of which were of the mild type, the remainder having the following complications:—

One case, acute lobar pneumonia on seventh day, course of fever mild. Suppuration of parotid gland in four cases. One case, the eruption faded on the fifth morning, and the next day a well-marked eruption of measles appeared, with a catarrhal inflammation of the eyes, nose, and bronchi. One case, œdema during convalescence without any apparent renal disease. Another case was followed by anæmia. Two cases had acute Bright's disease. Eight cases had severe diphtheritic inflammation of the throat. Two cases were followed by cardiac paralysis and death. One case had ulcer of the elbow and genitalia and peritonitis.

Selenkow³⁸⁶ reports the case of a girl aged nine years. On the third day of an attack of scarlet fever diphtheria manifested itself, on the sixth a swelling of the cervical glands on the right side. In a week's time a large fluctuating abscess was opened by a small incision and a small drainage tube introduced. On the third day the dressings were stained with blood, and there was free hæmorrhage when they were removed, which was controlled by pressure. The common carotid was tied in two places at the level of the cricoid cartilage and cut. There was left-sided paralysis for about three weeks, which was still partial after six months, and at this time there were great weakness, choreic disturbances, and inability to concentrate the attention. There was no decided pulsation of the right external maxillary and temporal. The left hand was held in extreme flexion and pronation, the fingers and thumb drawn into the palm. The patient could change this position only by a strong effort of the will. During sleep the hand and fingers were spontaneously relaxed, to return to the abnormal position again when the patient awoke. The muscles on the radial side of the forearm were slightly atrophied. The left foot inclined inward, and in walking the right leg was dragged a little.

Dr. Warren⁶ reports the following interesting case:—

“Boy about eight years of age, suffered from scarlet fever. Fourteen days after the rash had disappeared œdema of the eyelids and hands was observed. There was a considerable quantity

of blood present in his urine, for which hazeline, among other drugs, was tried, but without obvious benefit. The usual fomentations were applied, and he had several hot baths; but on the fourth day after the appearance of the œdema he was seized with a convulsive fit, the clonic spasm being, however, entirely confined to the left side. On being called, the writer at once gave him a hot-blanket bath and injected one-eighth of a grain (0.0081 gramme) of pilocarpine over the deltoid. Although free perspiration soon followed these agents, the stertor seemed to increase and the coma to deepen. After consultation it was decided to try venesection. The median basilic vein was opened, but so altered was the blood and so weak was the circulation that only a few drops of thick, treacly fluid escaped. After trying various means to increase the flow, which were ineffectual, the incision was covered up and the boy was left to die. Next morning, however, he was laughing and chatting, and in three weeks more he was fit to go to the sea-side."

Had a free flow of blood been obtained from the boy's arm, the author would have been inclined to credit the venesection with the cure, and, reasoning from that, would have been more inclined to adopt that practice in any similar case.

Ashby³⁶⁶_{Ed. 2d, p. 2} says the question of the relation between scarlet fever and rheumatism is of great moment. A simple scarlatinal synovitis is often recognized which has nothing to do with rheumatism; it is usually of short duration, seldom attacking a joint twice, and usually appearing on the seventh to the ninth day of the disease. It almost always occurs after a long period of fever, after suppuration of glands or decided pharyngeal symptoms.

Differing from this form of synovitis and difficult to distinguish from true rheumatism is a joint affection which, like nephritis, comes at the end of the third or fourth week, and oftener in young adults than in children. This form of scarlatinal rheumatism is usually complicated with endocarditis.

Sometimes pericarditis and pleuritis occur in connection with suppurating glands of the mediastinum, or pericarditis may be the evidence of pyæmia in connection with a severe case of scarlatina. The friction murmurs which are so frequently heard in scarlatina must, therefore, be regarded as evidence of functional disorder of the pericardium. Pericarditis and endocarditis are most frequently

seen during the second or third week after scarlatina, and then in conjunction with pain in the joints.

The author observed dilatation and hypertrophy of the heart only occasionally with nephritis, and the degree of compensatory hypertrophy seemed to depend upon the duration of the disease and the condition of nutrition of the patient. While dilatation of the heart may take place in a few days, it is also true that the heart will quickly resume its normal proportions after a nephritis has been recovered from. Dilatation involves all the cavities, especially the left.

DeWitt⁵³ reports the following interesting case of purpura hæmorrhagica in scarlet fever: The author was called to see child aged seven, who had been ill for three days, complaining of headache, sore throat, etc. Upon inspection the throat and hard and soft palates were found to be very much affected, and the right tonsil enlarged so as to interfere with deglutition. As there were no other symptoms in the case save that of the throat, the author did not suspect scarlet fever. On the following day the writer discovered that two children living in the same house were convalescing from scarlet fever. The patient did well until the eighth day, when the writer was informed by the father that the child's feet were swollen and the toes of both feet were black. Nothing was thought of the latter condition, the swelling being attributed to kidney disturbance. Directions were given to continue the medicine already prescribed. In the morning a message came stating that the patient was very much worse, that his whole body was turning black. The author called at once, finding, to his great surprise, the patient in very much the condition described. Both feet, the right thigh, including the entire gluteal region, the right elbow, forearm and hand, left hand and wrist, and right ear were discolored, and numerous small extravasations were observed at other points of the body. The discoloration was almost gangrenous in appearance.

The pouring out of such large quantities of blood into the subcutaneous areolar tissue produced a most profound impression on the system at large, as evinced by the extreme anæmia, pallor, weakness, etc. A singular feature of the case was the absence of hæmorrhage from the mucous surfaces. The patient died from exhaustion.

Gumprecht,⁵⁰ July 5; Aug. 11⁹ after carefully excluding complications and extraneous conditions, in a study of two hundred and twenty

eight cases of scarlatina, at the General Hospital at Friedrichshain, found a secondary fever in thirteen cases, or 5.7 per cent. of all. He thus sums up the results of his study:—

1. In a small proportion of cases of scarlatina there follows a distinct secondary fever, without detectable complication. 2. This fever immediately succeeds the scarlatina, or sets in some days after the temperature has reached the normal, and lasts of itself from a few days to almost two weeks. It usually disappears with improvement in the general condition, and in the vast majority of cases terminates in recovery. Death may result from exhaustion or from the occurrence of grave complications, to which the secondary fever sometimes seems to predispose. 3. The fever is probably a distinct form of secondary infection and is related to the streptococcus of scarlet fever. It is also probable that the streptococcus finds entrance through the inflamed tonsils. 4. The biological activity of the streptococcus seems to exhaust itself in the pyogenic action as a visible expression. 5. For the practitioner the recognition of the secondary fever demonstrates that the continuance of fever does not necessarily make the prognosis of scarlatina the worse, but that he must be prepared for severe complications occurring late.

Couper²¹³ reports a case of jaundice occurring in a child who was recovering from scarlet fever. It appeared at the time of desquamation.

Treatment.—Haas³⁸⁶ gives the following treatment for Bright's disease after scarlet fever:—

Milk diet, warm baths followed by warm packs and the administration of black coffee, and the following prescription:—

R Sodii bicarb.,
Sodii sulphat.,
Tr. convallar. maj., āā 31 (4 grammes).
Aquæ destillat., q.s. ad f 33 (93 grammes).
M. Sig.: Six to eight teaspoonfuls daily.

With pyrexia, antipyrin; with continuing diminution of the urinary secretion, calomel (one to three grains per dose) (0.065 to 0.194 gramme); with eclampsia enemata of chloral hydrate, or chloroform narcosis, and along with this, as stimulants, musk and æther. Should the urine become very bloody, ergot with nitric acid or Monsel's solution is ordered. Astringents, and notably tannin or sodium tannate, concludes the treatment.

Chakhovskoi⁶⁸³ recommends the salicylic treatment of scarlet fever, the recommendation being supported by one hundred and twenty-five malignant cases of the disease with only three deaths. He always employs the following formula :—

R Acid salicylic, gr. 15 (1 gramme).
 Aq. destil. fervid., f 3 2 (8 grammes).
 Syr. aurant. cor., f 3 1 (31 grammes).

M. Sig.: From a teaspoonful to a tablespoonful every hour during the day-time and every two hours at night.

The solution of acid is said to be perfect as well as palatable. In about two or three days the patient's temperature falls from 41° C. (105.8° F.) down to 38.5° C. (101.3° F.) or 38° C. (100.4° F.), reaching 36.5° C. (97.7° F.) about the tenth day of the treatment. To prevent any relapse the mixture must be administered every two hours for two or three days after the defervescence. Dr. Chakhovskoi states that salicylic acid, when administered after his plan, successfully prevents all complications (such as uræmia, dropsy, diphtheroid anginas, lymphadenitis, etc.), and even rapidly removes them when they are present. The salicylic treatment fails, according to his experience, only (1) when it is resorted to too late (later than the fourth day of the disease in malignant cases), and (2) when there are simultaneously present certain severe chronic diseases or serious congenital defects.

Clark,² has found that carbolized oil, by inunction, is useless as a germicide. He suggests that a preparation of olive-oil containing about one drachm (4 grammes) of ol. menth. pip. to twelve ounces is more efficacious in destroying any parasitic virus that might be contained in the epidermic scales.

Boxall,² thinks that, apart from the germicidal inefficacy of the carbolized oil, inunction of greasy material over the whole surface, by providing a more or less impervious coating, is well calculated to retard the healthy action of the skin, and to throw an increased strain upon the kidneys at a time when they are especially susceptible to injury.

A course of tepid antiseptic baths which, while hastening the desquamative process, not only disinfects the epidermis as it separates, but also promotes instead of checking the healthy action of the skin, offers an alternative line of treatment which is preferable to inunction in any form.

Armstrong²²⁷ has treated sixteen cases of scarlet fever successfully with *guaiac*. He employs the following formula:—

R	Ex. guaiac fl.,	. . . . .	3 2	(8 grammes).
	Tr. aconiti rad.,	. . . . .	M 6	(0.0065 gramme).
	Syr. simp.,	. . . . .	q. s.	f3 2 (62 grammes).

M. Sig.: One-half teaspoonful every two hours for a child one or two years old.

This dose may be increased or the medicine given oftener if necessary. It is taken without the addition of any water, so as to get its best local effect. When constipation and scanty secretion of urine occur, the writer employs pulv. jalapæ comp. in sufficiently large doses to produce free evacuation of the bowels.

MEASLES.

Etiology.—Jeffries⁹⁹ reports a second attack of measles after a short interval. J. C., four years, was taken ill on the 4th of June. First seen on the 6th, when he had a rash on the face, chest, and back. The rash was red, slightly itching, elevated, distinct, the spot varying in size from a sixteenth to a quarter of an inch in diameter, and roughly circular in form. Fauces slightly reddened; lungs resonant; full of large, moist râles; soft cough; no diarrhoea; pulse, 80; morning temperature, 98.4° (37° C.); respiration, 22. On the morning of the 7th, the rash was more developed on the body; pulse, 94; temperature, 99° (37.22° C.); respiration, 34. The rash rapidly vanished, did not scale, and by the 13th of June the patient showed no sign of disease. During the next four weeks the author saw the child frequently playing about the house.

On July 20th he was suddenly taken ill, and the following condition was found: Eyes, catarrhal conjunctivitis; face, with a red, distinct, papular rash over malar bones, spots from a sixteenth to a quarter of an inch in diameter; slight, low cough; large, moist râles; slight congestion of fauces; temperature, 99° (37.22° C.); pulse, 100. On the 23d the rash had spread over the body, was patchy, and the cough increased. The next day the child rapidly returned to health, though distressed by a crop of little blisters on the 26th, apparently due to too much iodide of potassium.

Raymond¹¹⁸ reports three cases of second attack of measles after an interval of three years.

Morbid Anatomy.—Moos⁵ has found alterations in the labyrinth in measles which pertain to the lymphatics and the blood-

vessels. In the former the lymph coagulates and the cells accumulate; they also fill up the semicircular canals and the cochlea. The endothelium undergoes fatty degeneration. In the blood-vessels the destruction is nearly complete in the Haversian canals and in the spiral ligament. The muscles undergo waxy degeneration. The nerves become gelatinous and, at places, entirely atrophied. The cells of Corti's membrane are also similarly degenerated. Notwithstanding the intensity of these lesions and the frequency of auditory complications in measles, permanent deafness is a rare sequence.

Symptoms.—Montefusco¹¹⁸ made careful observations of an epidemic of measles which occurred in Naples in 1887-88. During the period of invasion the author observed in a number of cases the complete absence of fever. Some of the cases had simple *malaise* and non-febrile catarrh of the conjunctivæ and the nasal mucous membrane. Absence of fever in the early stage seemed to have no bearing on the subsequent course of the disease. Epistaxis occurred frequently during the first stage, but was never abundant and had no particular prognostic value.

Among the different varieties of the eruption, one case resembled, at first sight, that of hæmorrhagic variola. This form, especially in cachectic children, has been noticed by Vogel, Rayer, Willan, and Günzburg. In two cases the eruption remained after the disappearance of the fever. The temperature was not above 102.2° F. (39° C.) during the period of invasion in the majority of cases.

The fever was continuous in all, ceasing on the seventh or eighth day, very often when the eruption appeared. The urine was diminished in quantity, the chlorides were diminished, and the sulphates and phosphates were sometimes increased. In rare instances a trace of albumen was found.

Complications.—The respiratory apparatus is most frequently affected. A dry and paroxysmal cough, without expectoration, usually begins on the third or fourth day of the invasion, dry and sibilant râles being discoverable by auscultation. Symptoms of bronchial catarrh are sometimes apparent before, and sometimes simultaneously with, the invasion. In such cases there is more or less abundant expectoration of mucus with moist râles. During the period of eruption the bronchial catarrh is always more diffuse

and the expectoration more abundant. The latter is sometimes sero-mucous and sometimes there are nummular sputæ, suggestive of phthisis.

Capillary bronchitis is not infrequent, and often leads to fatal results by suffocation or by slow asphyxia. Laryngitis appears during the period of eruption, with attacks of dyspnœa, as in croup. Convulsions are frequent during the period of invasion, but never during convalescence.

Disorders of the digestive apparatus are common. Frequent vomiting of greenish mucus occurs during the period of invasion. Diarrhœa is very frequent during the invasion, but is rarely severe. Either erythematous or ulcero-membranous stomatitis is present in almost every case.

Dr. Bayle¹⁰⁸ says that paralysis following measles is more frequent in the female than the male, and more frequent in children than in adults. It occurs during convalescence, and usually appears in the following order and frequency: paraplegia, hemiplegia, and various cerebral forms. The paraplegic form is of short duration and can usually be cured.

Diagnosis.—According to Tyler,²⁷ diagnosis depends upon the recognition of a group of symptoms. No disease is like it save rōtheln; and this can be easily distinguished, if the severity of the catarrhal symptoms, the nature of the cough, the appearances of the fauces, and the high febrile movement at the height of the eruption be recognized.

Bouchut⁶² states that fever, accompanied by redness of the eyes, weeping, coughing, and sneezing, is a premonitory symptom of measles. Red spots, irregular, slightly raised and disseminated over the whole surface of the body, accompanied with fever and with furfuraceous desquamation, are characteristic.

Tyler²⁷ says that during the stage of invasion and before the anatomical changes are noticed on the surface of the body an eruption will be found, by careful examination, upon the velum palati, which constitutes the surest sign of the affection.

We would especially indorse this statement.

Prognosis.—Tœplitz¹⁵⁸ says measles is a dangerous infectious disease in very young children, especially if they be suffering from other disease at the time of the attack. The danger is not in the infectious process *per se*, so much as in the changes excited by it in

the respiratory tract. Rachitis seems to furnish a protection from severe lung complications, a statement we think very questionable.

Tyler lately read an interesting paper²⁷ on measles before the Washington Obstetrical and Gynæcological Society. He thinks that Ellis is in error in giving the average mortality of the disease as one in fifteen, and that it is really much lower. Among the negroes of the District of Columbia, who constitute about one-third of the population, the mortality is both relatively and actually greater than among the whites. This, he thinks, plainly demonstrates the potency of insanitary environment, for the negroes generally live in the utmost squalor.

Treatment.—Montefusco¹¹⁸ does not consider medicinal treatment necessary in cases which run the regular course. He thinks it irrational to seek to subdue the fever. This does not signify that high temperature should be disregarded if it reach such an elevation as to produce granulo-fatty degeneration of the tissues, or diminish the resisting power of the patient, and produce functional trouble of the heart and brain which may lead to paralysis.

Alimentation is the treatment for such conditions, and the writer regards the suggestion of Semmola and Dujardin-Beaumetz, to substitute glycerine for alcohol, as a very good one. Children who were treated with glycerine by the author retained their strength, showed diminished temperature, and excreted less urea. An ounce (31 grammes) of glycerine may be given daily, combined with about eight ounces (249 grammes) of water and half a drachm (1.9 grammes) of citric or tartaric acid.

The broncho-pulmonary complications should be treated with a combination of infusion of ipecacuanha, tincture of aconite, and syrup. Iodide of sodium diminishes expectoration and rapid breathing. When the cough is particularly rebellious good results are obtained by giving iodide in combination with bromide of sodium.

Tyler says²⁷ the cough of measles does not yield to ordinary palliatives. Cool water and ice pellets give some relief. A mixture of bromides, chloral, and deodorized tincture of opium in a syrupy vehicle gives good results.

Huchard¹¹⁸ uses in heart and lung complications dry cups twice a day, fifteen centigrammes (23 gr.) each of Dover's powder and powdered squill thrice daily, alcohol in tonic doses, sinapisms to the lower extremities, and hypodermic injections of caffeine.

Bayle¹⁰⁸_{Mar. 1} employs the following treatment in the paralysis following measles: Should paralysis depend upon simple congestion of the marrow it is to be treated with ergot, strychnia, and the galvanic current to the spine, followed by a cold douche, the faradic current being employed at the same time to stimulate the paralyzed muscles. This should be followed by dry friction, sulphur- and sea-baths. If the symptoms do not subside chronic inflammation may be feared and iodide of potassium should be given in small doses. Heat may be applied to the spine or an eschar made with the thermocautery. Calomel in small doses is of service and laxatives are indicated. Should respiration become difficult or the heart fail, artificial respiration and injections of ether must be used. If congestion is evident, a wet cup should be applied to the nape of the neck. In case of retention of urine a catheter must be passed two or three times a day.

RÖTHELN.

Osborn⁸²_{Dec. 31, '79} states that there is one pathognomonic feature eminently distinctive of rötheln, one, indeed, so constant in its occurrence that when observed there can be no longer a doubt, an enlargement of the small glands just at the edge of the hair on the postero-lateral sides of the neck. This feature has never been absent in any case coming under the author's observation.

Complications.—C. W. Smith⁵⁶_{July} saw, in an epidemic, two cases complicated by rheumatism—one a child, the other a young girl, neither of whom had ever been affected with rheumatism. There was great pain in the right ankle, the wrists, and the first and second metatarso-phalangeal joints, attended with swelling and tenderness, which lasted, however, but a day or two. The attacks occurred on the second and third days of the eruption respectively. Blepharitis marginalis resulted in one case, a young, healthy girl.

Greenlee⁵¹_{Oct.} says that out of sixty cases of rötheln distributed between both sexes, and ranging in age from two to twenty years, thirty were followed by severe catarrhal pneumonia, and thirty by scarlet fever. Dulles¹⁹_{Feb.} reports a case in which rötheln was followed by undoubted evidences of pus formation in various parts of the body, including the brain.

Treatment.—Mayers¹⁹⁹_{Aug.} treated thirty cases of rötheln without one death by first using saline purgatives and diuretics, followed by salicylic acid and pyrophosphate of iron.

DIPHTHERIA, PERTUSSIS, AND PAROTITIS.

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DIPHTHERIA.

NOTWITHSTANDING the many preventive and remedial measures which have been recommended and applied, and strenuous efforts of health boards to limit and control it, diphtheria continues to extend, and every year largely increases the mortality in both hemispheres. The following table exhibits the mortality from diphtheria and croup, which is but a form of diphtheria, and, for the purpose of comparison, the mortality also from scarlet fever in New York City since 1880 :—

Diphtheria.			Croup.			Scarlatina.		
1880 . . .	1390	910	618	1884 . . .	1090	748	608	
1881 . . .	2249	1088	1964	1885 . . .	1325	855	559	
1882 . . .	1525	729	2066	1886 . . .	1727	968	371	
1883 . . .	1009	644	744	1887 . . .	2167	889	589	

In six consecutive months in 1888 the deaths from diphtheria in ten of the principal cities of Europe were as follow ⁶⁷_{Oct. 30} :—

Inhabitants.		Deaths.		Inhabitants.		Deaths.	
London	4,282,921	852	Copenhagen . . .	300,000	210		
Paris	2,260,945	1047	Buda-Pesth . . .	442,787	207		
Berlin	1,414,980	528	Christiania . . .	135,600	196		
St. Petersburg . .	928,016	341	Prague	300,825	161		
Vienna	1,212,232	251	Amsterdam . . .	390,016	136		

Etiology.—During the last year many experiments and microscopic examinations have been made, in order to discover the cause and throw light upon the nature of diphtheria. These have strengthened the belief that the cause is microbic, but it is still doubtful which microbe is the causal agent, or whether there may not be more than one species of bacteria which, by action upon and in the tissues, cause diphtheria.

D'Espine¹⁹⁷_{Jan. 23} obtained the Löffler bacillus from the laryngeal pseudomembrane in a case of croup occurring without angina

(J-1)

and without complications of any kind, except such as occurred from the mechanical obstruction. The child had been tracheotomized in l'Hôpital Canton, and rapidly recovered. Pure cultures of this bacillus even to the twenty-fifth generation always preserved the same pathogenic characters in inoculations of the rabbit and guinea-pig. The fifteenth generation was sent to Löffler, who stated that the bacillus was identical in form and pathogenic properties with the bacillus discovered by him. In twenty-four cases of non-diphtheritic angina (the herpetic, etc.) Löffler's bacillus was not present in the scraping from the fauces, while in fourteen of the scraping in diphtheritic angina or croup with clear diagnosis the bacillus was uniformly present. Therefore, D'Espine believes that the presence or absence of this bacillus in cases of faucial inflammation of doubtful nature aids in diagnosis. Löffler's bacillus is thicker and better nourished in the pseudomembrane than in cultures. It has, says D'Espine, nearly the length of the tubercle bacillus and at least twice its thickness. But serious and fatal objections were soon found to the theory that the Klebs-Löffler bacillus is the causal agent in diphtheria. Löffler himself ascertained that it is not always present in undoubted diphtheria, and this stubborn fact, which militated against his theory, he sought to explain by the supposition that the bacillus, after producing the mischief, had died and been eliminated before the patient's death. This is certainly a very improbable explanation. But recent and more thorough microscopic examinations have demonstrated the fact that the bacillus of Klebs and Löffler occurs in non-diphtheritic cases, and even in healthy persons, as well as in diphtheria. Thus, von Hofmann-Wellenhof⁸⁴_{Ne. 3, 4} detected this bacillus in twenty-six of forty-five cases of various conditions of the buccal and faucial surfaces. He discovered it in seven cases of diphtheria, three of measles, in six of nineteen cases of scarlet fever, and in four of eleven normal cases. In cultures and experiments these bacilli from different sources seemed to be identical. Therefore, in the light of recent investigations, the Klebs-Löffler bacillus has no more significance as a cause of diphtheria than the micrococcus of Oertel.

Emmerich, of Munich,²_{Sept. 22} examined seven cases of diphtheria immediately after death, and in five of them found a short bacillus always accompanied by the streptococcus or staphylococcus pyo-

genes aureus. This short bacillus, not that of Löffler, was found not only in the mucous membrane of the larynx, trachea, and bronchi, but also in pneumonic infiltrations whenever they were present. A few times they were also found in the blood taken from the heart, but never in large numbers. On examining the pseudomembrane, Löffler's bacillus and other bacteria were found, among which was the short bacillus. In the superficial parts of the mucous membrane underlying the pseudomembrane the short bacillus was found with the staphylococcus and streptococcus, and in the deeper portions of the mucous membrane a larger number of the short bacillus occurred with a smaller number of other species. The laryngeal surface of cats and dogs was inoculated with the short bacillus, and an unmistakable pseudomembrane produced.

T. M. Prudden, of New York, has recently made cultures and experiments which will direct attention to another microbe, the streptococcus, as perhaps the causal agent in diphtheria. The well-known ability of Dr. Prudden as a microscopist and the unusual pains which he takes to avoid sources of error will render his paper, now in process of publication,⁵ the most important of the recent contributions to the etiology of diphtheria. Even Oertel, who twenty years ago was a strenuous advocate of the theory that the micrococcus is the causal agent of diphtheria, now states²⁵ that, though many bacteria occur in the diphtheritic pseudomembrane, there are only two which are to be considered in studying the etiology of diphtheria, to wit, the streptococcus or chain-forming coccus, and the bacillus or rod-shape bacterium with rounded extremities. Oertel has recently endeavored to elucidate the etiology of diphtheria by a minute examination of the structural changes which occur in the various organs of the body under the influence of diphtheria, but, although his investigations throw light on the pathology of this disease, they seem to have effected little toward determining the causal agent. The identification of the specific microbe and of the ptomaines which it produces will be the work of the future.

B. K. Rachford,⁹ in commenting on our present knowledge relating to the causation of diphtheria, states that the most experienced bacteriologists do not find in the blood or tissues any microbes which can sustain a causal relation to diphtheria. Every pseudomem-

brane holds many bacteria, but they are chiefly such as are normally present in the mouth; and, in addition, septic bacteria also occur. The Klebs-Löffler bacillus is found especially at the deepest part of the pseudomembrane, but never in the blood or tissues. Cultures of it when inoculated in animals produce a whitish growth in two days. Guinea-pigs and fowls died after subcutaneous inoculation with it, a whitish exudate having appeared at the point where the virus was received. Rachford adds that this bacillus, applied to the larynx of the rabbit or fowl, produces a membrane resembling that in human diphtheria, and that young are more susceptible than old animals to inoculation by it. Although these facts strongly support the theory that the Klebs-Löffler bacillus is the cause of diphtheria, nevertheless Rachford says, as has been stated above, that a bacillus apparently identical with this is occasionally found in the mouths of healthy persons. It has been ascertained that some bacteria in their growth produce poisonous alkaloids or ptomaines; several of these have been isolated, analyzed, and obtained in a crystalline form, and produce certain definite symptoms when introduced into the bodies of animals. Mydeleine, which Brieger isolated from cadavers undergoing decomposition, when introduced into the system, increases the secretion of the eyes, mouth, and nose, causes a chill, followed by fever, involuntary urinary and fæcal discharges, and in some instances convulsive movements, paraplegia, dyspnœa, and death. These facts relating to this ptomaine give strength to the theory that the prominent symptoms in diphtheria are caused by ptomaines which result from microbic action, and not directly by the microbes themselves. Enlargement of the lymphatic glands, congestion, and ecchymosis of the kidneys and other organs are known to be sometimes produced by irritating chemical agents. Therefore, from what we know of the nature and action of ptomaines, and from the fact that those microbes which are supposed to sustain a causal relation to diphtheria are found only on the surface, it is highly probable that systemic infection and the pronounced symptoms to which it gives rise result from ptomaines.

Rachford presents the following summary of his views: (1) diphtheria is a purely local disease; (2) it is caused by an external parasite; (3) this parasite is practically not strictly aërobic; (4) the constitutional symptoms are due to the absorption of poisonous

materials, viz.: ptomaines from the local lesion; (5) the changes occurring in the blood and tissues, including the late nerve lesions, are caused by the direct or indirect action of ptomaines; (6) this disease has no latent stages, and second and third attacks are due to re-infection; (7) one attack, as a rule, gives at least temporary immunity; (8) after the limited period of immunity has expired, the previous attack may act as a predisposing cause to other attacks if it has left the mucous membrane of the throat in an irritated or inflamed condition; this is more likely to occur in scrofulous subjects; (9) complications may occur from the entrance into the body of septic germs.

A. Jacobi, ²_{Sept. 12} in a paper read before the Section of Diseases of Children of the British Medical Association in August, accepts the theory that probably in most instances microbic action in diphtheria is limited to exposed surfaces which are the seat of the specific inflammation, and that systemic infection occurs by the entrance of ptomaines into the lymphatic and circulatory systems. On the other hand, he believes that it is not improbable that in certain instances, especially in those of a long incubative period, the virus enters the system directly through the lungs. He also expresses the belief that one attack of diphtheria does not at all protect the system from a second seizure.

Some of the above aphorisms of Rachford are far from being accepted by the profession. That an attack of diphtheria furnishes temporary immunity from the disease is not believed by some of the highest authorities. We shall see, in our remarks on prevention, that Jacobi (and no one in America has had larger clinical experience with diphtheria than he) expresses the belief that patients during convalescence sometimes are reinfected, and have an exacerbation or recurrence of the disease by receiving the poison from the bedding, curtains, or furniture which they themselves have infected. As in that other microbic disease, erysipelas, one attack of diphtheria does not appear to afford any protection against a second seizure.

The fact is very apparent, from the recent literature of diphtheria, that the mooted question whether this malady at its commencement is constitutional or is localized on the surface where the inflammation appears still divides the profession. Very decided opinions have been expressed by experienced physicians in support

of both opinions. If the theory that the microbe or microbes which cause diphtheria act only on the surface of it holds true in all cases, we would certainly be led to infer that diphtheria is primarily local. On the other hand, the long incubative period of seven or eight days in certain cases comports best with the theory of primary systemic infection, for it is difficult to understand how a microbe so powerful and active as the diphtheritic could remain so long a time on the tonsillar or other surface on which it has lodged without producing some visible evidence of its presence. Perhaps diphtheria is sometimes local in its commencement and at other times systemic—local when no symptoms are present except such as are plainly referable to the local disease, as in the milder forms of diphtheritic pharyngitis, and systemic when fever, thirst, prostration, and loss of appetite precede for some hours, or even a day, the local inflammatory manifestations of the disease. Whether diphtheria is primarily local or constitutional, or whether it is in some instances local in its origin and in others constitutional, will perhaps remain undetermined until the specific principle is more accurately ascertained and its mode of action determined.

Mode of Propagation.—During the past year interesting instances have been reported showing how readily diphtheria may be communicated, even to children at a distance, by articles which have been removed from the sick-room without proper disinfection. The usual mode of infection is, as all know, through the air, but a considerable number of cases are recorded in which diphtheria was communicated by direct contact. The expulsive cough of the patient whose throat was being examined caused the lodgment of a particle of pseudomembrane, or infected muco-pus, in the eye of the physician or attendant, and set up a dangerous diphtheritic conjunctivitis. Notwithstanding the voice of warning, the over-anxious and self-sacrificing young surgeon sucks the obstruction from the tracheotomy tube, relieving his patient with perhaps a fatal result to himself. Recently the journals publish another instance of gross carelessness in a surgeon in not properly disinfecting his person and instruments. Having performed tracheotomy in a case of diphtheritic croup, he soon after employed the same instruments for circumcision. The wounded prepuce quickly became the seat of a severe diphtheritic inflammation. Observations are accumulating which show that diphtheria, or a disease

closely resembling it, occurs in animals, and is sometimes communicated from them to man. Bild,¹⁴ states that the island of Skiathos, off the northeastern coast of Greece, had been entirely free from diphtheria during at least a third of a century, when a dozen turkeys were introduced from Salonica. Two of them were sick at the time, and died soon afterward, and the disease appeared in the remainder, seven of which died. The two remaining turkeys at the time of the examination were found to have difficult breathing, due to a pseudomembrane which covered the larynx and swelling of the glands of the neck. They recovered, and one of them had subsequent paralysis of the legs. An epidemic of diphtheria commenced in a house near the garden where the turkeys were kept and spread over the island. One hundred and twenty-five cases occurred, with thirty-six deaths, in a population of four thousand. Delthil,²⁴ in an instructive paper on the transmission of diphtheria from animals to man, relates a considerable number of instances in which the genuine disease was apparently contracted in this manner. These cases, in connection with those previously published by Menzies,¹¹⁹⁶ Nicati,⁴⁶ Wheeler,²²⁴ Turner,¹¹ and the inoculations of Trendelenberg, Oertel, Zahn, Gerhard, Francotte, Velpeau, and others, render it probable, perhaps we should say certain, that genuine diphtheria, equally fatal and attended by the same anatomical characters and symptoms as in man, does occur in birds, both the wild and domesticated, and in certain quadrupeds, as the rabbit. Nevertheless, we should add that certain eminent pathologists, among whom we may mention the honored name of Virchow, have doubted the identity of animal and human diphtheria. With our present light upon the subject, it is evident that since our relations with the domestic animals are so close, if they are sick with any disease resembling diphtheria the same precautionary measures should be taken to prevent infection of the family as in human diphtheria. We shall consider again the modes of propagation when treating of prevention.

Diphtheria from Cats.—A report has been made to the Central Board of Health of Melbourne,² describing an outbreak of diphtheria, the cases occurring almost simultaneously, in the neighborhood of Daylesford. One child died, but the others are progressing favorably. The local health officer has furnished a report pointing out the strong *prima facie* evidence that the

children contracted the disease from cats, numbers of which are dying in the neighborhood.

Age.—The statistics of diphtheria in all countries are uniform as regards the age at which the disease is most likely to occur. A large majority of the cases are under ten years, and after the tenth year the liability to be attacked diminishes as the age increases. Still, a few cases have been reported even after the age of fifty years. Oertel has stated that infants in the first half-year are “not at all susceptible to the disease.” As in scarlet fever, so in diphtheria, cases are rare under the age of four months, nevertheless, newly-born infants are not entirely exempt. Tigri treated a child of fourteen days; Bretonneau, one of fifteen days; Bednar, one of seven days; Bouchut, one of eight days; Weikert, one of seven days; and Jacobi, three cases, occurring on the ninth, thirteenth, and sixteenth days after birth; Sirédey also reported eighteen cases occurring in 1877 in the Hospital Lariboisière, and Parrot also mentions cases. In 1888 diphtheria entered the maternity wards of the New York Infant Asylum, and five cases of diphtheria in the newly born were treated by myself, which have been fully reported in my paper ⁹ on “Sepsis and Diphtheria of the Newly Born.”

Incubation.—The incubation of diphtheria, when communicated by inoculation, is short. In animals inoculated by Trendelenberg the incubative period was from one to three days; in those inoculated by Lagrane, about twenty hours; and in Duchamp's inoculations the animals perished in about forty-eight hours with an abundant production of the pseudomembrane. In Oertel's experiments the animals perished in from thirty to forty-two hours. When an individual contracts diphtheria by direct contact with an infected object the incubative period is also short, but it may be as long as four days. Thus, Phillips has published the case of a child of eighteen months, who was circumcised, the same instruments being employed which had been used a few hours previously in performing tracheotomy. Four days subsequently the diphtheritic pseudomembrane appeared upon the wound of the prepuce. It is well known that when diphtheria is contracted in the usual way, that is, through the inspiration of infected air, the incubative period is from two to eight days, with an occasional case outside of these limits.

Thos. F. Raven² says that in the opinion of most physicians a membranous exudation upon the surface of the throat, in connection with pharyngitis, affords sufficient evidence that the disease is diphtheria. His experience leads him to believe that cases occur which can be clearly distinguished from diphtheria. He recently witnessed, in an institution of eighty children, a severe epidemic of exudative tonsillitis, sthenic in type, and the "wash-leather-like patches of considerable extent" were like those in diphtheria. The cases were usually severe, with an early temperature as high as 105° F. (40.55° C.). The disease was "extremely infectious," and it "undoubtedly arose from sewer-gas." No case of paralysis or albuminuria occurred, and all recovered, but the recovery was not attributable to the treatment, although potassium chlorate was used. More recently, Raven has witnessed a similar epidemic, limited to thirteen cases. He designates the disease exudative tonsillitis. All the patients recovered with no treatment except by potassium chlorate. The disease was produced by sewer-gas escaping into a lavatory. No albuminuria or paralysis occurred in this second epidemic. Raven believes that the disease which he witnessed in these two epidemics was a contagious tonsillitis distinct from diphtheria. We believe that it was either the so-called follicular tonsillitis or amygdalitis, which sometimes extends through a family or asylum like an epidemic, and which often presents the features of a contagious disease, and perhaps will yet be shown to be contagious, or the disease which Raven saw was diphtheria. It is not improbable that the latter supposition is correct, for epidemics of the disease may occur of such a type that all recover if the number of cases be small.

Baginsky, corresponding editor, states that Bischofswerder describes a disease, which he designates rhinitis pseudomembranosis, in which thick, white, fibrinous pseudomembranes appear on the nasal surface of children, and the pharynx remains normal or is not similarly affected. He does not believe that the nasal disease is diphtheritic. Baginsky, in commenting on this opinion, admits that we occasionally meet cases in which a pseudomembrane forms upon the nasal surface without any diphtheritic exudate upon any of the other surfaces. This pseudomembranous rhinitis, whatever its pathological nature, yields to treatment by the injection of a weak solution of borate of sodium. Mild

astringents are said to effect a cure in cases in which a suppurative inflammation accompanies or follows this nasal disease.

Insidious and Unusual Forms of Diphtheria.—Cadet de Gassicourt, ³⁰⁸_{June 11} has cited several examples of insidious or abnormal diphtheria cases in which infectious bronchopneumonia rapidly developed or croup rapidly supervened on an apparently benign diphtheria. A man attacked with an amygdalitis which Barthez said did not have the diphtheritic character, three days subsequently exhibited symptoms of systemic infection of rapid development which ended fatally. A diphtheritic bronchitis may become complicated with an anginose inflammation. The disease is ascending instead of descending, as in ordinary instances. Finally, in a case of croup occurring in connection with an apparently benign angina, tracheotomy was performed under apparently favorable conditions. Then occurred an aggravation of the angina, systemic infection, and speedy death. Such are some of the variations in the march of diphtheria which surprise and disconcert the physician who is not forewarned.

Féréol ⁴³⁸_{May 28} relates the case of a woman of fifty years who had malaise and chills. Examination disclosed redness of the right anterior pillar of the fauces and a small grayish patch upon the right tonsil. The next day she had high fever, slight glandular swellings, loss of voice, and pain at the base of the neck. The laryngoscope revealed a false membrane in the larynx. Her breathing became difficult, sibilant râles and a bronchial *souffle* were heard in the chest, she had retrosternal pain, was extremely depressed, and death occurred within forty-eight hours. Her urine was not albuminous, but it contained sugar. It was probable that she had diabetes mellitus before the occurrence of diphtheria. Diphtheritic inflammation in her case was propagated from the tonsil to the larynx, and thence to the trachea and bronchial tubes. Cadet de Gassicourt, in commenting on this case, states that he knows no sign by which pseudo-membranous bronchitis could be positively diagnosed except by the expectoration of pseudo-membrane.

Chronic Diphtheria.—Jacubowitsch, of St. Petersburg, ¹⁵⁸_{Dec. 10, 11}, describes a case of diphtheria which lasted two months. A child of one year and three months had scarlet fever, followed some weeks later by diphtheria. The pseudomembranes remained

upon the tonsils and vault of the pharynx for two months, when death occurred from laryngeal stenosis. A child of ten years had diphtheria, with severe septic symptoms. The diphtheria and adynamia continued two months, when convalescence occurred.

Symptoms.—The cases of diphtheria which have been reported and the histories of epidemics which have been published during the past year show, as usual, that the type of the disease has varied greatly in different patients. Clinical observations have added but little to our knowledge of the clinical picture of diphtheria except as regards albuminuria and paralysis. Whether we consider them symptoms, complications, or sequelæ, they are the most important of the phenomena pertaining to the clinical history of diphtheria.

Albuminuria.—Recent observations, like those in former years, continue to show the frequency of diphtheritic albuminuria. Bouchut and Erupis found it in two-thirds of their cases, Germain Sée in one-half of his, Sanné in two hundred and twenty-four cases out of four hundred and ten, and I discovered it in twenty-four of sixty-two consecutive cases in family practice. Sometimes the occurrence of albumen in the urine is transient. Albuminuria occasionally, though rarely, occurs as early as the first day, and a large majority of the recorded instances have been between the first and eleventh days. The proportion of albumen present varies greatly in different patients, and often in the same patient at different times. Albuminuria is most likely to occur in cases of a severe type, but, as in scarlet fever, it is sometimes present in mild attacks of diphtheria. The albuminous urine, unlike that of scarlet fever, commonly appears normal to the naked eye, even when chemical tests or heat show a large proportion of albumen. Oertel ³⁴_{Nov. 50, 51, 57; Mar. 2} ⁶ says: "The albuminuria of diphtheria is referable to many causes, of which the virus circulating in the blood is only one. Cardiac failure, respiratory difficulty, the febrile process, are adequate for the production of this symptom. The kidneys, in cases where albuminuria has been present, may be quite normal, or, on the other hand, they may exhibit varying degrees of parenchymatous inflammation." The two common causes appear to be passive congestion of the kidneys, as of other organs, occurring during the dyspnœa of croup or from heart-failure, the albumen escaping from the overdistended renal veins, and parenchymatous

nephritis in which the tubules contain detached and disintegrating epithelial cells. In parenchymatous nephritis granular casts are commonly present. As regards prognosis, most recent writers agree that diphtheritic albuminuria, when the proportion of albumen is moderate and there is no notable diminution of urine, does not usually tend to a fatal result, but in severe cases, with other symptoms unfavorable, a large proportion of albumen and marked diminution of urine constitute an unfavorable prognostic sign. Sanné says: "Diphtheritic albuminuria is an epiphenomenon which, in the vast majority of cases, remains without influence upon the course of the disease." But cases do occur in which death results solely or chiefly from the renal disease. I have elsewhere related such a case, in which the diphtheritic attack was mild, and all the other symptoms, except those which were referable to the kidneys, were slight, even trivial; but the urine became very scanty, almost suppressed, and highly albuminous, and death resulted.

H. Barbier¹¹⁹⁷ carefully examined one hundred and thirty cases of diphtheria with special reference to albuminuria. He made daily examinations and discovered albumen in the urine at some stage of the disease in three-fourths of the patients. In half of the cases he detected traces of albumen as early as the third day. Barbier states that the albuminous urine is somewhat diminished in quantity, of normal color, and often containing urates, which deposit on cooling. If much albumen be present, the urine may be high-colored. A deep color, with scantiness, indicates a fatal termination, and an increasing quantity is a favorable omen. A large quantity of albumen early in the disease is a bad sign. Barbier also remarks that anasarca and uræmia are not met with, that the urine is never blood-stained, and that there is no tendency in the nephritis to become chronic. Barbier's last statement needs some qualification, though I believe it holds true in regard to a large proportion of instances. Within the last twelve months I have treated a boy of six years who, after an attack of mild diphtheria, was found to have blood-stained urine, of a specific gravity of 1010 and under. It contained blood-corpuscles and renal casts. He at no time had anasarca, scantiness of urine, or any appreciable deterioration of the general health, or loss of appetite, but the urine,

though free from blood-corpuscles and casts, and of normal specific gravity, now after the lapse of eight months still contains a trace of albumen.

Paralysis.—The paralysis occurring in diphtheria has recently been the subject of extended monographs and of interesting discussions in medical societies. W. H. Thomson,⁹ of the New York University, in an able paper, read before the Neurological Section of the New York Academy of Medicine, on this form of paralysis, expresses the opinion that the acute infectious diseases have, in reality, three stages: (1) the prelatent or incubative period; (2) the developmental or manifestation period, and (3) the postlatent period, which is “not a sequel of the preceding two but a necessary and integral stage of the whole process.” Viewed in this manner, diphtheritic paralysis pertains to the postlatent stage of diphtheria. It presents features which differentiate it from most other forms of paralysis. Thus, the paralysis of certain muscles abates, while that of other muscles increases. This shifting of the paralysis from one group of muscles to another, observed in many cases, is a notable characteristic. Palatine paralysis, which, with the exception of the abolition of the tendon reflexes, is the most common form of diphtheritic paralysis, was formerly attributed to the paralyzing action of the pharyngitis on the terminal nerves of the fauces; but the falsity of this theory was shown by the fact that paralysis of the muscles of the pharynx occur in cases in which no pharyngitis has been present, and in which the diphtheritic inflammation occurred upon other surfaces, as the cutaneous. “The exemptions of diphtheritic paralysis are quite noticeable and peculiar. Besides the nerves of hearing and of sight, we have a striking exemption of the vasomotor and trophic nerves.”

Dr. Thomson also states that a strong argument against the theory that diphtheritic paralysis arises from central lesions in the nervous system is the fact that a nerve is paralyzed while an adjacent nerve, whose origin is closely contiguous, retains its normal functional activity, and a branch of a nerve is paralyzed while other branches escape. Structural changes are found in the peripheral nerves in diphtheritic paralysis, but Dr. Thomson does not believe that they result from a neuritis, properly speaking, but from degenerative changes similar to the Wallerian degeneration.

"The great clinical feature of neuritis is pain; the absence of pain is the distinctive feature of diphtheritic paralysis."

In discussing the cause of diphtheritic paralysis, Dr. Thomson says it is "quite conceivable that a ptomaine may follow upon the changes which the diphtheritic process sets up in the organism, and thus produce all of its characteristic symptoms."

A. Jacobi,⁹ believes that diphtheritic paralysis undoubtedly sometimes results from, and is prolonged by, central lesions, and it is proper to consider the so-called post-diphtheritic paralysis as a part of the disease, rather than a sequel. Diphtheria, as much or more than any other disease, runs an indefinite course, and one attack does not prevent another, but increases the liability to it. But in many instances he thinks that what seems to be second or third attacks are simply continuations of the disease, the specific principle having been concealed in the tonsils or lymph bodies, and liable at any time to cause renewal of the disease. Paralysis of the muscles of respiration and paralysis of the heart due to weakened action of the sympathetic or pneumogastric also occur, and are likely to be fatal. To prevent this paralysis alcoholic stimulants and heart tonics are required early and continuously in diphtheria. When symptoms of heart-failure occur it is usually too late for such remedies to do much good.

Preventive Measures.—The prevention of diphtheria is obviously a matter of the highest importance, and every legitimate method designed to effect this object should be rigorously enforced by the action of health boards and legislative enactments. The area of contagiousness of diphtheria is small, extending only a few feet. Dumez has stated that in a school the boys and girls upon the same floor were separated by an open space a few yards wide. Diphtheria prevailed among the girls but did not affect the boys. As regards the small extent of the area of its contagiousness, and the persistence and highly infective character of the diphtheritic virus within that area, diphtheria resembles scarlet fever, and is unlike measles and pertussis, the specific principles of which, although they have a wider contagious area, are more volatile and more quickly dissipated.

In the spring of 1888 an epidemic of diphtheria occurred in the New York Infant Asylum, and extended to the maternity ward. The ward was vacated, the windows, doors, and crevices

closed, and forty pounds of sulphur, or two pounds to the one hundred cubic feet of air, was burnt until it was consumed. Then the doors were opened, and Drs. Prudden and Cheeseman immediately raised a dust from the floor and bedding and allowed it to settle in culture media. All other sources of infection were excluded from the media. The cultures produced so large a number of microbes that they overlaid each other, but they were able to distinguish the streptococcus pyogenes in the media, identical in form and appearance with the streptococcus which they had previously discovered in two fatal umbilical phlegmons which had occurred in the ward in connection with diphtheria. Although more sulphur was used than is recommended and employed by the New York Health Board and in the manner recommended by the Board, it was inadequate to destroy the microbes. It was evident that some more efficient mode of domiciliary disinfection was required. Since the ordinary mode of disinfection was apparently futile in the maternity ward, it seemed to me advisable to obtain the views of so eminent an authority as E. R. Squibb, of Brooklyn, and he has kindly favored me with the following note: "Within the past ten years the efficacy of sulphur fumigation against infectious material has been repeatedly denied and reaffirmed upon very good authority, and observations apparently made with accuracy and care have been reported from time to time to prove both sides of the question, so that all that can now be said is that burning sulphur is of doubtful efficacy, with the weight of the highest authorities in bacteriology against it. But to this it must be added that it is still largely used by very intelligent bodies in large institutions, boards of health, etc., where it would not be likely long to maintain an unearned confidence. How often the fumes are applied dry, and how often moist, no one can tell from the current record, and how many of the failures of the dry gas would be successes in the presence of moisture there is no means of knowing. Formerly, when sulphur was burned in closed chambers as a disinfectant, the surfaces were all wetted, and the pot of burning sulphur was set in water or wet sand, that the heat might evaporate off a constant supply of watery vapor. These conditions are now frequently, if not generally, neglected, and where this is the case failure on principle should be the rule. Nearly all, if not all, chemical disinfectants are, in a state of tension,

ready to change on coming in contact with the matter to which they are applicable, and these changes are either by oxidation or deoxidation, and the moment of greatest power or activity is the moment of change, when they, by reacting on infectious matter, pass from a state of tension to a state of rest under new relations. The agency through which these changes almost universally become operative is the vapor of water. When sulphur is burnt in a closed chamber the dioxide is formed by condensing two molecules of oxygen from the air upon each molecule of sulphur, and a heavy gas is the result, which tends to settle at the bottom of the chamber and to run out through the lower cracks. Any moisture present is at once seized by the rather inactive anhydride, first forming sulphurous acid, and then, by oxidation from the air, sulphuric acid. The dry gas, or anhydride, not only seizes with avidity all watery vapor in the air but also the water held in the surface of all bodies with which it comes in contact, and in the presence of this moisture only is it ready for further oxidation. Then it is by this oxidation that it deoxidizes the matters with which it is in moist contact, filling the surfaces of these matters, first with sulphurous acid, then by the change with sulphuric acid, and it is during these changes that its power is exerted. If there be no moisture supplied to the burning sulphur, that which was present in the air and the surfaces of the chamber is soon used up, and the dry gas remains indefinitely in a comparatively inactive, ineffective condition. The dry passive anhydride would necessarily destroy all organisms which breathed in any degree, because breathing surfaces are moist. But in embryonic life protected by shell, as in seed, if the shell be dry the gas would be impotent. Many bacteriologists have admitted that burning sulphur would kill bacteria, but not germs."

It seems probable that the apparent negative result of burning sulphur for the purpose of destroying the microbes in the maternity ward, as stated above, was due to the absence of moisture, for it was burnt dry. I have employed the following prescription for the purpose of disinfection during my attendance on cases with apparently so good a result that I am encouraged to continue its use:—

R Acidifcarbolic,
 Ol. eucalypti, āā 3 1 (31 grammes).
 Spts. terebinthinæ, 3 8 (249 grammes).—M.

Add two tablespoonfuls to one quart of water, in a shallow pan with broad surface, and maintain it in a constant state of simmering in the room occupied by the patient.

It was employed in the quarantine ward of the infant asylum in which diphtheritic patients were treated, and to a certain extent in other wards, and no subsequent cases have occurred.

In Bellevue Hospital, where pyæmia had been prevalent, R. Ogden Doremus employed chlorine gas mingled with steam to procure disinfection in the following manner: Strips of paper having been pasted over the crevices around the doors and windows of the infected ward, equal parts of common salt and black oxide of manganese, two hundred pounds, were placed in troughs formed of sheet-lead, the edges being turned up to form receptacles. A carboy of sulphuric acid was emptied into small basins and other vessels and placed beside the troughs. The floors were moistened with water and abundant steam was allowed to escape from the heaters into the ward. With the aid of assistants, the sulphuric acid was quickly poured upon the mixture in the troughs, and the ward hastily vacated. On the following day the windows were opened from without, and after ventilation the contents of the troughs were stirred and sulphuric acid added as before. No further cases occurred in the wards disinfected in this manner.

But diphtheria will continue to spread and largely increase the aggregate of deaths until stringent measures be employed to prevent its propagation by mild walking cases. Children mildly affected with diphtheria, with little or no complaint of sore throat, are allowed to go abroad. They enter public conveyances, sit among other children in the schools or churches, are allowed to promenade the streets, and call upon their friends. I have in a number of instances seen children with diphtheria sitting among other children in the clinics at Bellevue, and have in many instances traced the disease directly to the schools where one or more of the children had complained of sore throat. Recently, in a case of fatal diphtheria, an only child of about eight years contracted the disease apparently from embracing a playmate in the street who had been allowed to leave the house for the first time after an attack of diphtheria. I see no way to prevent the propagation of diphtheria by these mild cases, except by enforced stringent inspection and surveillance of children by parents, nurses, and teachers. During an epidemic of diphtheria, and wherever, as in most of the cities, diphtheria is established as an endemic, children who have the least sore throat should be excluded from the

schools and be compelled to remain at home. In order, also, to adopt adequate protective measures, the fact should be recognized that third persons who have had no diphtheritic symptoms and infected apparel or furniture may be the medium of communication.

De Crésantignes ²⁴_{Aug. 20, Sept. 1} states that in 1884 he was externe to l'Hôpital des Enfants Malades in the service of Jules Simon. It was his duty to take notes, examine diphtheritic patients, and watch the cannulæ of tracheotomized cases. When he left the service each day he thoroughly washed his hands, and did not remember having ever soiled his clothes with the blood, mucus, or particles of pseudomembrane, and at no time did he have symptoms of diphtheria. After the day's work he returned to the rooms occupied by his mother. The mother, without any other exposure, so far as could be ascertained, contracted diphtheria, of which she died. That the disease was conveyed by the garments worn and infected during the hours of service in the pavilion could not be doubted. An interne of l'Hôpital de la Pitié visited the child of one of the employés of the establishment, whom he found with diphtheria, for which he prescribed. He then returned to his father's house, a long distance, on foot, and embraced his parents and sister. On the following day the sister, who had not been exposed to any patient, complained of her throat, and the next day her tonsils were covered with the characteristic pseudomembrane, and the cervical glands were slightly tumefied. The brother, who had not changed his clothes after visiting the patient, was apparently the medium of communication, although he himself was not affected with the disease.

De Crésantignes records additional cases, mostly taken from the literature of diphtheria, showing that this disease is sometimes communicated by third persons, who are themselves well. The vehicle of infection must be the clothing or persons. Cases like the above certainly teach a very important lesson. Nurses and physicians attending diphtheritic patients should avoid, so far as possible, the infection of their persons and clothing. Physicians, in examining the fauces of children with diphtheria, are very liable to receive upon their faces or clothes particles of the pseudomembrane or infected muco-pus, ejected by the violent cough which the examination excites. This may to a considerable extent be prevented by standing to one side during the examination; but I

constantly carry corrosive sublimate with me and wash my face and hair with a solution of it before leaving the apartment if I suspect that I have received any particle of the infected material upon my person. Physicians thus exposed should also make use of precautionary measures in their subsequent visits to other children.

Caillé¹ stated that occasionally children had a recurrence of diphtheria each spring or autumn. Thinking that such children might harbor or carry with them the germ of the disease, he selected eight children having a permanent residence who had had repeated attacks of diphtheria and subjected them to treatment. All carious teeth which might harbor the poison were extracted or filled, the mouth was rinsed after each meal with a solution of potassium chlorate, sodium chlorate, or sodium borate. The solution was also gargled and injected or drawn through the nostrils. With this treatment the children have escaped the customary diphtheritic attack during the two years which have supervened. Dr. Caillé believes that wherever diphtheria is prevailing parents should daily inspect the fauces of their children before sending them to school, and those having signs of pharyngitis should be kept at home and from other children. Tonsils with their uneven surfaces should be removed, and kissing upon the lips forbidden. Children old enough to gargle should do so after each meal, using a weak antiseptic solution, a few drops of which should be drawn into the nostrils.

Jacobi, in discussing Dr. Caillé's paper, concurred in the opinions expressed in the paper, that the poison might remain lodged in the depressions of an unhealthy mucous membrane and in neighboring lymphatic glands. Treatment of the diseased surface and of the tumefied glands was therefore needed in order to prevent an outbreak of diphtheria. A diseased surface is more readily infected than one healthy. Dr. Jacobi expressed his decided conviction that patients recovering from diphtheria were sometimes reinfected and had recurrences of the disease by exposure to the infected bedding, curtains, or furniture of the apartment. To prevent this renewal of diphtheria, if there are only two rooms the patient should be transferred from one to the other at intervals of a few days and the vacated room thoroughly ventilated and disinfected.

Treatment.—Many cases, with details of treatment, and a

considerable number of monographs recommending certain modes of treatment, have been published in the medical journals during the last year. The tincture of the chloride of iron, corrosive sublimate, and the milder germicides seem to be more and more used in the internal treatment of diphtheria, while for local use those remedies are more generally prescribed which are actively antiseptic but non-irritating, or but slightly irritating.

A. Jacobi, ^{Sept. 22} gives the following outline of the treatment of diphtheria which, with some variations, is indorsed by the most successful and experienced physicians of the present time. He recommends the tincture of the chloride of iron in the general treatment of diphtheria. He says that an infant of one year can take one drachm (3.88 grammes) daily. He insists on the necessity of quiet in bed with the full sustaining treatment. He recommends giving heart tonics or stimulants early, as digitalis, strophanthus, spartein, caffein, camphor, alcohol, and musk. "It is advisable to use them at an early date, particularly in those cases in which antipyrin or antifebrin are given." He recommends one or two doses of two to four minims (0.13 to 0.26 gramme) of the fluid extract of digitalis, or, as a heart tonic of more speedy action, the sulphate of spartein. Of the latter drug an infant of one year can take one-tenth of a grain (0.0065 gramme) four times daily.

Dr. Jacobi, also, like most other physicians who have treated diphtheria, recommends alcoholic stimulants in large doses and employed early. He states that he has often seen children live with ten ounces (310 grammes) of brandy each day who were doing badly with three or four. Caffein is a good heart tonic, and one to five grains (0.064 to 0.32 gramme) of the salicylate or benzoate of caffein and sodium dissolved in two to ten minims (0.13 to 0.65 gramme) of water may be given subcutaneously. Camphor, five to twenty grains (0.32 to 1.29 grammes) in twenty-four hours, is also a good heart stimulant. It may be employed hypodermically in five parts of almond-oil. Strychnine may also be employed regularly from the beginning of heart failure. But the best internal stimulant in urgent cases of heart failure Dr. Jacobi believes to be Siberian musk, given in a thin mucilage. If ten to fifteen grains (0.65 to 0.97 gramme) given within three or four hours to a child of one to two years do not restore a healthy heart action the prognosis is bad.

Dr. Jacobi states that, perhaps, the bichloride of mercury is the most useful internal remedy. He has given to an infant of four months one-fourth grain (0.016 gramme) in twenty-four hours, and to children of three to five years one-half grain (0.032 gramme) daily, from four to eight days or longer, each dose varying from one-sixtieth to one-thirtieth grain (0.001 to 0.002 gramme). The bichloride requires a dilution of one to six thousand or one to ten thousand in water or milk.

R. H. Chittenden^{9 Feb. 10, '90} states that "iron salts retard the action" of pepsin. The tincture of the chloride of iron has for many years been prescribed as an efficient blood restorer in diphtheria, and is still, probably, more frequently prescribed than any other remedy, and the confidence in it appears to be justified by clinical observations, but only a moderate quantity of it can be assimilated, the remainder of the doses passing away in the stools, giving them the dark colors. If it be a fact that the salts of iron diminish the digestive power of pepsin, perhaps it would be best to employ frequent doses of moderate size instead of the large doses which are coming into use. Professor Chittenden also says: "Among the newer drugs, antipyrin and antifebrin both retard the action of pepsin; antipyrin when present to the extent of 3 per cent. almost entirely stopping the action of the ferment." This is an important statement, since antipyrin is prescribed in diphtheria and scarlet fever, in both of which diseases medicines are urgently required which assist digestion. Alcohol, which is employed in larger doses in diphtheria than in any other of the infectious maladies, Professor Chittenden says, also retards digestion when present in the stomach, but it is quickly absorbed, even in fifteen minutes, and its disappearance is followed "by the secretion of an active, strongly acid gastric juice, which continues generally long after the food is entirely digested."

Tinctura Ferri Chloridi.—Even if this agent retards digestion in a measure, as Professor Chittenden says, we infer from the fact that it has been so long and largely used in the treatment of diphtheria that substantial benefit has been observed from its employment. Its use is recommended by nearly all physicians who, from their ample experience, are considered as authorities, and the tendency is now to use it in larger and more frequent doses than formerly. Goldschmidt, of Strasburg,^{67 July 15} recommends

giving twenty to forty drops of the tincture of the chloride of iron every five to ten minutes while the child is awake, and every quarter hour during sleep, followed by cold milk. When the patient is of suitable age, Goldschmidt also employs a strong solution of the chloride of iron locally (five grammes [77.16 grains] of the chloride to one hundred grammes [33 32] of water). A pledget of cotton soaked with this solution is pressed against the pseudomembrane and is allowed to remain in contact with it for a moment, so that the liquid penetrates it and bathes the inflamed surface underneath. The iron destroys the microbes and produces a crumbling mass, which loosens its hold in a few days and is thrown off.

Kourtchinsky ⁵⁸⁶ ¹⁴ _{Nov. 8, 10; May 2} prescribes the internal use of the chloride of iron in the treatment of diphtheritic anginas. He has employed the following potion in fifty-six cases with the loss of only six patients:—

R Ferri chloridi,	8 grammes (3 2).
Glycerini,	15 grammes (3 3¼).
Aquæ,	180 grammes (3 5 3 1).

Children take from half a teaspoonful to one teaspoonful, and adults a tablespoonful every half hour to two hours, according to the gravity of the attack, day and night. The prolonged use of iron does not exert any unfavorable effect on the organs of digestion or other organs, and the improvement in the angina is often very rapid. The use of quinine, milk, beef-tea, brandy, and occasionally, perhaps, an emetic completes the treatment. In other forms of angina besides the diphtheritic, Kourtchinsky says that the chloride of iron thus employed promptly diminishes the pain and hyperæmia and exerts a curative action. In herpetic angina the pain and dysphagia are soon improved; in phlegmonous angina, although an abscess may not be prevented, the symptoms yield more readily than to any other medicament, and in catarrhal angina marked improvement often occurs after two or three doses. Mycotic and scarlatinal anginas are also favorably influenced by this agent.

Carbolic Acid.—Gaucher, of Paris, ⁴⁰ _{Sept.} recommends a mode of treatment which was common thirty years ago under the lead of Bretonneau and Trousseau, but which has long been discarded by the intelligent and experienced physicians of the present age. He

applies, with rubbing and firm pressure, to the diphtheritic patch a liquid prepared by dissolving ten grammes (two and one-half drachms) of crystallized carbolic acid and thirty grammes (one ounce) of camphor with ten grammes (two and one-half drachms) of alcohol. This solution is mixed with the same quantity of sweet oil. This application, of course, cauterizes the denuded surface. This operation is repeated twice daily and the throat is irrigated every second hour with a 1 per cent. solution of carbolic acid. This escharotic treatment is based upon the theory that diphtheria is at first local, and if when local the poison is destroyed systemic infection does not occur. But such severe measures cannot be justified in the light of modern experience. Severely irritating applications only increase the inflammation and cause a greater exudation, and disinfection may be produced by the use of sprays, which are not painful and do not irritate.

Sodium Hyposulphite.—I. H. Fruitnight⁵¹ has treated during the past year with the sodium hyposulphite. He prescribes the following solution, a teaspoonful to be given every two hours: For children under one year, one drachm (3.88 grammes) of the hyposulphite to two ounces (sixty-two grammes) of water; for older children, one and a half drachms (5.82 grammes) to two ounces (sixty-two grammes) of water, and for adults, two drachms (7.77 grammes) to two ounces (sixty-two grammes) of water. At the same time he administers the tincture of the chloride of iron. Of the thirty patients thus treated only two died.

Chloral Hydrate.—Mercier¹⁰⁸ reports good results from this medicine. If the tongue is furred he first prescribes an emetic, preferably ipecacuanha, administers the necessary food and stimulants, and, when the throat is clean, one and a half to five grains (0.097 to 0.32 gramme) of chloral are given in the form of syrup. Chloral, used early in this manner, usually arrested the disease, and in forty-eight hours the pseudomembrane disappeared. It was administered every half hour. This treatment was useful only in the early stages of diphtheria.

Carbolate of Sodium.—Barrois¹⁷ gives the following result of the treatment of eighty-three cases by the local use of the carbolate of sodium. All the cases were cured at periods varying from two to twenty-three days, with an average of five days. The treatment by this agent is applicable to all patients, whether used

as a gargle, by the spray or brush, and is devoid of danger. Sometimes during its use the urine becomes dark, when its employment should be discontinued. This appearance of the urine was observed in two cases of croup, but both recovered. He believes that this carbolate tends to make the local disease mild and to prevent infection, if it be employed sufficiently early. He does not state the strength of the solution employed.

Salicylic Acid.—Ory¹¹⁸_{Aug.} has for several years treated diphtheria by repeated local applications of concentrated solutions of salicylic acid to the fauces, and cure has usually been effected by the fifth day. In no instance has diphtheritic laryngitis supervened in so severe a form that tracheotomy was required. The following is his formula:—

R Infus. eucalypti,	.	.	.	.	3 3	(93.3 grammes).
Glycerini,	.	.	.	.	3 2½	(9.72 grammes).
Acidi salicylici,	.	.	.	.	gr. 4½	(0.29 gramme).
Aq. laurocerasi,	.	.	.	.	gr. 15	(0.97 gramme).—M.

This is applied by a brush or swab every hour during the day and every second or third hour at night. Ory believes that general infection of the system, as well as extension of the inflammation to the larynx, may be prevented by the early and continued treatment of the tonsils and fauces by his method. He states that the solution of salicylic acid acts promptly in destroying the pseudo-membrane, with but little irritation of the tissues underneath. The applications should be made promptly and thoroughly.

Antiseptic Vapors.—Paterne (Maine-et-Loire)⁶⁷_{Oct. 16} believes that the use of antiseptic vapors is preferable to any other mode of treating diphtheria. Vapors are readily absorbed and easily employed, while much of the medicine employed in the usual way is often lost. He employs for vaporization carbolic acid and eucalyptus. A warm atmosphere loaded with aqueous vapor renders expectoration easier, but when it contains in addition the vapor of the above antiseptics, it appears to exert an important curative effect on the disease. Renou⁶⁷_{Oct. 16} employed a solution of carbolic and salicylic acids in alcohol. A tablespoonful was added every three hours to two pounds of boiling water. His statistics prior to August, 1886, embraced forty-eight cases with eight deaths, twenty-two tracheotomies with six deaths. Bonamy, Barthélémy, Sance, and Geffrier may be mentioned among the physicians⁶⁷_{Oct. 16} who have

employed the vapors of tar, turpentine, eucalyptus, and carbolic acid with encouraging results. Even in cases of diphtheritic croup and after tracheotomy the percentage of recoveries has been large with the inhalation of these vapors.

Sulphur.—H. V. Knaggs⁸⁰ states that the antiseptic properties of sulphur have been known from the remotest antiquity. Homer refers to it as a disinfectant in both the Iliad and Odyssey. From the time of Pliny sulphur as a disinfectant has been tested in every age. In 1858 the vine mildew caused by the oidium tuckeri attracted attention, and the use of powdered sulphur was found to destroy this fungus and prevent the spread of the disease. This led certain French physicians to employ sulphur in the treatment of diphtheria, and at the present time a large number of physicians highly recommend its use as a remedy for this fatal malady. The sublimed or precipitated sulphur-powder, blown over the faucial surface through a quill, tube, or insufflator, has apparently produced very beneficial results in the practice of many physicians. Lutz, of Wurzburg, has employed sulphur for seventeen years, apparently with marked benefit. He applies the powder by insufflation every two, four, or six hours. Mr. Knaggs believes that the internal use of small doses of sulphur if “slowly swallowed or sipped” is equally useful with insufflation, since the sulphur “clings to and acts upon the leathery growths in a like manner.” He employs the following formula:—

R. Sulphur (precipitated),	. . .	3 1½	(5.82 grammes).
Chocolate powder,	. . .	3 1	(3.88 grammes).
Cinnamon-water,	. . .	℥ 1	(3.88 grammes).
Glycerine,	. . . q. s. ad	℥ 3	(93.31 grammes).

M. Sig.: Half a teaspoonful to one teaspoonful is given every hour.

Turpentine.—Röse⁵⁹ asserts that he has employed turpentine during the last four years, and has lost only five cases out of sixty with this treatment. Two of the fatal cases were infants of one year, who appeared moribund when first seen and died soon afterward. The other fatal cases were very severe, two dying within thirty-six hours and one after five days. The oil of turpentine was prescribed in drachm (3.88 grammes) doses three times daily. Sweet spirits of nitre was used as a corrective with it, one part of the spirits to fifteen of the turpentine. A 2 per cent. solution of salicylate of sodium was also given in tablespoonful doses every two hours, and potassium chlorate was prescribed as

a gargle when the patient was of suitable age. A very generous and stimulating diet of strong broths, milk, port wine, etc., was also employed. With this treatment rapid amelioration occurred, and it was usually not necessary to give more than five to eight doses of the turpentine.

Schmiedler⁷⁴⁴ recommends applying pure turpentine to the surface, which is the seat of diphtheritic inflammation, since it does not irritate like carbolic acid, dissolves the false membrane, and is antiseptic. It should be applied every third hour, and no drink should be allowed afterward for a quarter of an hour. He vaporizes lime-water and carbolic acid in the room, surrounds the neck with an ice-bag, rubs mercurial ointment into the enlarged glands, gives internally calomel in the commencement of the disease, and during the disease quinine, benzoate of sodium dissolved in ether, and small doses of potassium chlorate.

Corrosive Chloride of Mercury.—Stumpf¹¹⁸ lost 76 per cent. of his cases of diphtheria in an epidemic continuing from May, 1883, to March, 1884. In December, 1884, he was called to a child of two and a half years, whose pharynx was covered by pseudomembrane. The throat was sprayed every three hours with a solution of corrosive sublimate, employed in Richardson's atomizer. This treatment soon effected a cure. Subsequently, thirty-one cases were treated entirely with this agent, and all but two recovered rapidly. Of these two, one died after two applications of the sublimate, and the other, after the lapse of four weeks, from a complication. In most of the cases the temperature, which had been at 40° to 41° C. (104° to 105.8° F.), fell to normal in twenty-four to forty-eight hours without other antipyretic. At the same time the development of pseudomembrane ceased, deglutition became easier, and the patients showed desire to eat and drink. The pseudomembrane could usually be readily detached in three to five days. In no instance did poisoning result, but in one salivation occurred in from three to five days. The solutions prescribed were as follow :—

For children under	2 years, 0.05	gramme ($\frac{3}{4}$ grain)	to 200 grammes ($\frac{3}{4}$ 6) water.
For children from 2 to 6 years, 0.1	gramme (1 $\frac{1}{2}$ grains)	to 200 grammes ($\frac{3}{4}$ 6) water.	
For children over	6 years, 0.2	gramme (3 grains)	to 200 grammes ($\frac{3}{4}$ 6) water.

Mentha Piperita.—W. L. Braddon⁶ reports experiments which show that the oil of peppermint has antiseptic properties

equal if not superior to those of carbolic acid and corrosive sublimate, while it is harmless to the system in large doses. Five cases are reported showing that the oil may be inhaled pure for an almost unlimited time without producing ill effects, and that it has an immediate beneficial effect in phthisis when used by inhalation. In two cases of diphtheria the pure oil was freely and copiously applied twice daily, with abatement of the fever and marked improvement in the symptoms generally.

Eucalyptus Globulus.—I. M. Gibbes, of New Zealand, ⁸⁰_{Oct.}, states that oleum eucalypti, taken into the system in the food or inspired air, is excreted by the glands of the throat and will prevent the further formation of membrane. Paralysis has not followed any case treated by the eucalyptus. Properly employed, it does not discolor the pseudomembrane, prevents sepsis, and procures throughout a pure breath. By its stimulating action it tends to counteract the depressing effect of diphtheria and of warm, moist atmosphere when saturated with it. The oil of the eucalyptus is contained in the leaves of the tree, and they should be placed in a vessel of boiling water under a tent made over the patient's bed. Of one hundred and forty-five cases thus treated only one died, and in several of them laryngitis occurred. A colleague who adopted the eucalyptus treatment also lost only one patient in one hundred and thirty cases. Dr. Gibbes states that in the summer of 1888 he treated one hundred and six cases without a death. This remarkable result he thinks was due to the constant use of the antiseptic steam. Until he commenced using eucalyptus in the manner stated he lost every bad case, and while in 1881 and 1882 he lost only 2.5 per cent. of his cases by the employment of the eucalyptus, a colleague lost 20 per cent. of his cases by other treatment. Since his colleague has employed the eucalyptus steam, his percentage of fatal cases has been greatly reduced. Gibbes has also published similar very favorable statistics ²⁸⁵_{July 15} of the treatment of diphtheria by what he designates the "constant blue-gum steam" employed by himself and Dr. O. Carroll. But some, at least, of the Australian physicians evidently distrust the statistics of Dr. Gibbes. Dr. Snowball states that Dr. Gibbes' statistics of the treatment of diphtheria correspond precisely with his own statistics of the treatment of follicular tonsillitis, a disease which is common in Melbourne, while true diphtheria is comparatively rare.

Pilocarpine.—Casadesús relates the case of a child of six years with diphtheritic patches on the fauces and with commencing croup. Pilocarpine and perchloride of iron (chloride) cured the patient without tracheotomy. Another child was tracheotomized and given hydrochlorate of pilocarpine and in three days all trace of the pseudomembrane had disappeared. A girl of three years with tonsils, uvula, soft palate, and nasal fossæ covered with pseudomembrane was cured in a few days by the hydrochlorate of pilocarpine, chloride of iron, and local applications of lemon-juice. Another child of four years with hypertrophied tonsils had diphtheritic patches over the fauces, croupal cough, dyspnoea, enlarged submaxillary glands, and fever. Ipecacuanha, extract of quinine, and sulphide of calcium were prescribed and turpentine employed locally and its vapor inhaled. The patient not improving, the muriate of pilocarpine was used, but as the dyspnoea increased tracheotomy was performed. A. Jacobi¹¹¹⁷_{May 22} states that the secretion of the mucous membrane is greatly increased by the internal use of pilocarpine and by hypodermic injections of the muriate or nitrate of this drug, but the heart's action is enfeebled by its use. He has seen but few cases in which it could be safely employed a sufficient time to obtain its beneficial action on the local disease. It is one of the remedies by which we may "kill our patient."

Valderrama⁴¹_{Nov. 30} believes that by the profuse secretion which pilocarpine causes it tends to relieve the inflammations of the mouth, tonsils, and pharynx, and that it softens the pseudomembrane and aids in its detachment. In the last ANNUAL the profession were warned of the dangers attending the use of this in diphtheria. The sudden filling up of the bronchial tubes with secretion and the heart-failure which have followed its use in cases which might be related should prevent its further employment in diphtheria unless its effects be closely watched. The danger attending its use is so great that in my opinion it should never be prescribed for a diphtheritic patient.

Creasote.—Legroux, of Paris, treated sixty-eight patients with creasote at l'Hôpital Trousseau. He employed it in different ways:—

1. By constant vaporization in the pavilion, the following formula being used:—

R Creasote,	. . . . .	10 grammes (3 2½).
Alcohol,	. . . . .	100 grammes (3 8 3 2).
Water,	. . . . .	1 litre (1 quart).

2. Application, by a brush every four or five hours, of the following mixture:—

R Glycerine,	. . . . .	20. grammes (3 5).
Alcohol,	. . . . .	10. grammes (3 2½).
Creasote,	. . . . .	5.83 grammes (3 1¼).

3. In grave cases, hypodermic injection was employed of the following:—

R Creasote,	. . . . .	20 grammes (3 5).
Olive-oil (aseptic),	. . . . .	186 grammes (3 6).

The injection was easily made, with little pain and without danger, and ten, twenty, or thirty centigrammes (1½, 3, or 4½ grains) of the creasote, according to the age, were employed each time. The result of the treatment by creasote was favorable as regards the diphtheritic inflammations. The pseudomembranes seemed to be detached more readily than when lime-water or lemon-juice is used. The pseudomembrane was reproduced more slowly, and its fetidity disappeared rapidly. Still, the general result does not appear to have been very favorable, for a large proportion died.

Sodium Borate.—Noël ⁴³³_{May 26} believes that diphtheria is a constitutional disease with local inflammatory manifestations, and that an antiseptic should be employed which will penetrate every part of the system. For this purpose he selects borax. Of sixty patients treated with it only two or three died. The doses are fifty centigrammes (7½ grains) to one gramme (15 grains) for children under one year; one gramme (15 grains) to one gramme and a half (22½ grains) for those from the age of two to five years; two grammes (30 grains) between the ages of five and ten years, and for adults three to five grammes (forty-five to seventy-five grains.) The medicine should be given in equal doses every hour when the child is awake. No local treatment is employed. The treatment by borax is continued for a considerable time after the membrane has disappeared. Abundant salivation results from its use, and the increased secretion from the muciparous follicles and salivary glands tends to loosen the pseudomembrane and aids in dissolving and detaching it.

Tannin.—Cousot, of Brussels,²¹² states that the treatment of diphtheria in its commencement should be chiefly local; that it should destroy the germs of diphtheria wherever they appear; should entirely prevent putrefaction, and at a more advanced stage, when systemic infection occurs, local remedies should be still vigorously applied, and additional measures employed to relieve the general symptoms. The medicine for local use which Cousot believes best fulfills these indications is a mixture of glycerine, alcohol, and tannin, employed in the following formula:—

R. Mucilage of acacia,	100 parts.
Tannin,	10 parts.
Spts. of peppermint (<i>alcohol de menthe</i>),	2 to 20 parts.

The syringe is employed for its application, for this alone permits sufficient irrigation and impregnation of the inflamed surfaces. If the false membrane occupies the pharynx, the tonsils, or nasal fossæ, whatever may be the degree of its development, it is necessary to inject the mucilage and tannin into the mouth and nares every two hours. Whatever may be the degree of decomposition of the diphtheritic patch, its putrid odor ceases at the first application, and it contracts and becomes detached. A pseudo-membrane may re-form, and more than once, but it is thinner than at first. The efficacy of this method seems to be established by abundant statistics.

Bromidia.—A. H. Ferguson, of Manitoba, collaborator, writes us that during the last three years he has successfully treated four cases of diphtheria involving the larynx with bromidia, given in doses sufficiently large to produce stupor and prevent laryngeal spasms. To the patient having diphtheritic croup he administers, as soon as the dyspnœa occurs, hourly doses of bromidia, and then every two hours, so as to procure quiet breathing. He has observed immediate return of the laryngeal spasm and dyspnœa when the effect of the medicine was allowed to pass off, and the dyspnœa again subsided when the medicine was resumed. During the stupor stimulants and nutriment are gulped down without resistance. A stout boy of two years was kept asleep most of the time for five days by the use of bromidia. At the end of forty-eight hours he was allowed to waken, when two violent attacks of dyspnœa occurred and the medicine was resumed. Thirty-six hours subsequently the bromidia was withheld and symptoms of dyspnœa

reappeared. After another thirty-six hours the medicine was again suspended, and this time pseudomembrane was expelled by the cough, and the patient recovered. On the other hand, in certain cases bromidia entirely failed to control the laryngeal spasm and dyspnoea.

Nasal Diphtheria.—Jacobi¹¹¹⁷_{Nov. 22} states that nasal diphtheria is likely to terminate fatally unless energetic measures be employed, which should consist in prompt and repeated disinfection of the nasal surfaces. Unless such treatment be employed, general sepsis is likely to result through absorption, for the Schneiderian membrane is supplied with lymph-ducts and blood-vessels to an unusual degree. If the proper injections are made every hour, adenitis around the angles of the lower jaw resulting from absorption of noxious products from the nasal membrane is prevented. The treatment by injections is unsuccessful only when the nares are blocked and rendered impervious by the large amount of membranous exudate, through which it is difficult to pass a silver probe. Under such circumstances the probe, surrounded by absorbent cotton, moistened by a 50 or 90 per cent. solution of carbolic acid, should be used. "The liquids which are to be injected must be warm and fairly mild. Solutions of chloride of sodium, two-thirds of 1 per cent., saturated solutions of boric acid, one part of bichloride of mercury, thirty-five of chloride of sodium, and five thousand of water, more or less, or lime-water, or solutions of papayotin, will be found satisfactory. From the selection of these remedies it is at once apparent that the object in view is partly that of washing out and partly of disinfecting. I have not mentioned carbolic acid, which may be used in solutions of 1 per cent. or less. Its employment requires care, for much of the injected fluid is swallowed, and proves a danger to children of any age, but mostly to the young. Most of the syringes I find in my rounds are abominations. The nozzle must be large, blunt, and soft. After having recommended for many years the common hard-rubber car syringe, the sharp end of which was cut off, I now use always a short, stout, glass syringe with soft-rubber mounting in front. When the children cannot or must not be raised, I employ the same solutions from a spoon or a plain Davidson atomizer. These applications can thus be made while the children are lying down, every hour or very much oftener, without any or much annoyance.

The nozzle must be large, so as to fit the nostril. A single spray on each side will generally suffice. I am in the habit of covering the common nozzle with a short piece of India-rubber tubing. For a day or two these injections of fluids or spray must be made hourly. It is not cruel to wake the children out of their septic drowsiness; it is certain death not to do it. Injections of the nose are oftener ordered than judiciously made. Hundreds of times have I been assured that they had been made regularly, hourly, for days in succession. Still there was a steady increase of glandular swelling and sepsis. I never believe a nurse to have made them regularly unless I have seen her doing it. They *will* run up their syringe vertically and not horizontally, the fluid *will* return through the same nostril. On the successful injecting or spraying of the nares hangs every life in a case of nasal diphtheria. I have long learned to look upon a neglect to tell at every visit how to make an injection as a dereliction of duty. This may appear a trifling way, but it is a safe one. The nurse must be made to tell you that at every injection the fluid returns through the other nostril, or through the mouth, or is swallowed."

G. Guelpa^{485 51}_{May; Nov.} has tested irrigation of the nostrils and fauces in thirty-two cases of diphtheria. He states that the irrigation should be made, if possible, from the commencement of the attack, and with a pocket syringe. The injections, he thinks, should be made every quarter hour with a 5 to 10 per cent. solution of the chloride of iron, night and day, and the patient's diet should be mainly of milk. This treatment, he says, is safe, easy of execution, and will prevent to a considerable extent the spread of the disease. Nasal irrigation has a good effect in catarrhal, herpetic, and ulcerative anginas, and is therefore useful in many cases of doubtful diagnosis.

Menthol.—Cholewa¹¹⁶_{p.284} states that he has obtained most favorable results in nasal diphtheria by introducing within the nares plugs of cotton wet with a 20 per cent. solution of menthol. In cases in which syringing the nostrils is impossible on account of their occlusion by membrane, treatment by menthol was successful in removing the membrane and bringing the diphtheritic process to a stand-still.

Keiersen,³⁷¹_{Bd.19} on account of the difficulty of injecting disinfecting fluids into the nares in nasal diphtheria, uses a suppository made

of boric acid and cocaine inserted deeply until it reaches the posterior nares and is made to protrude. He believes that the boric acid thus used acts efficiently as a disinfectant upon the Schneiderian membrane, and, trickling down, aids in disinfecting the faucial surface.

During the last two or three years I have employed the following prescriptions for nasal injections with apparently very favorable results:—

R Acidi borici, 3 2 (7.77 grammes).
 Sodii borat., 3 2 (7.77 grammes).
 Sodii chloridi, 3 1 (8.88 grammes).
 Aquæ, O 1 (500. grammes).

Inject one teaspoonful, warm, into each nostril every second hour, the head being thrown back.

Or the following:—

R Hydrarg. chlor. corros., gr. 2 (0.129 grammes).
 Aquæ, O 1 (500. grammes).

One teaspoonful (one-sixtieth grain, 0.001 gramme) to be sprayed or injected into the nares or into the nares and fauces for patients between the ages of two to five years; two teaspoonfuls (one-thirtieth grain, 0.002 gramme) for patients between the ages of seven and twelve years.

Paralysis.—Mild cases will usually do well with good diet and simple tonic treatment. In ordinary cases either the galvanic or faradic current may be employed, but strychnia is regarded by good observers as the most reliable nerve stimulant in this form of paralysis, and, therefore, more useful than electricity. Oertel's objection to the use of strychnia, that, acting as an excitant of the spinal cord, it is likely to aggravate central lesions, is founded on a wrong understanding of the pathology of the paralysis. Henoch cured the paralysis in three weeks by hypodermic injections of strychnia. Reinhard employed a daily hypodermic injection of one sixty-fifth grain (0.001 gramme) of sulphate of strychnia for a boy of three and a half years, who had the paralysis in an extreme, nearly fatal, form. Immediate improvement followed, and after fifteen injections the patient was cured. Gerasimow⁶³⁰_{No. 20} administered daily subcutaneous injections of one thirty-first of a grain (0.002 gramme) and afterward one twenty-second of a grain (0.003 gramme) of strychnia in the treatment of a boy of six years having a severe form of the paralysis, and after nineteen injections the cure was complete. Still, some physicians of experience doubt the efficacy of strychnine as well as electricity in the treatment of

diphtheritic paralyses. W. H. Thomson, ⁹, says: "I have found the recourse to strychnia and to electricity very disappointing. I have not been able to assure myself that either the constant or the interrupted current is of much service when locally applied to the palate or throat-passages." Dr. Thomson employed local irritants which stimulate the nerves. In the treatment of palatine and pharyngeal paralysis he brushes the fauces every few hours with a paste of black pepper and honey. For paralysis of the limbs and trunk he envelops the part twice daily in a pack of infusion of capsicum, one drachm (4 grammes) to the pint (500 grammes). For internal treatment he prescribes tincture phosphori, one teaspoonful three times daily.

Notwithstanding the disparaging remarks made by physicians of experience in reference to the effect of electricity in the treatment of diphtheritic paralysis, the evidence is strong in favor of its employment. Thacher, of New Haven, ⁹, has reported a case in which galvanism was employed on the two paralyzed arms alternately for a week at a time. It was invariably found that the arm receiving the electricity gained more rapidly than the one untreated, the strength being tested by the dynamometer. This test seems to have been conclusive as showing the efficacy of galvanization.

The treatment of the most dangerous form of diphtheritic paralysis, the cardiac, should be prompt, and with a full appreciation of the condition of the patient. He should be quiet in bed with the head low. Hypodermic injections of brandy should be used, since they act promptly in sustaining the heart's action. Ammonia, camphor, musk, and the electrical current are useful auxiliaries. The predigested beef preparations, peptonized milk, and other concentrated foods, designed for those with feeble digestion, are also useful in cardiac as in other forms of paralysis. If the patient rally from the attack of cardiac weakness, he should remain in bed, so that any excitement of the heart may be avoided, as a recurrence of the heart-failure is not improbable.

Malcolm McLean, ⁹, states that diphtheritic paralysis in himself lasted four and a half months and was attended with marked hyperæsthesia. Symptoms of heart-failure occurred as early as the fourth day of diphtheria, and the heart's action was weak during the paralysis, the pulse at one time falling to thirty-two, and afterward suddenly rising to one hundred and sixty, and attended by a

most violent and nearly fatal angina pectoris. Faradization and galvanism were skillfully employed, but he grew worse with the exception of the paralysis of the fauces, which was markedly relieved. At length he took absolute rest in bed, and soon began to improve. He remained in bed one month, and he believes that the absolute rest was the important factor in the cure of his paralysis.

Treatment by Ling's System of Movements.—Kellgren,²² acting under the direction of Möbius, of Leipsic, employed the movement cure in the following case: Mary, aged fifteen years, had diphtheria in December, 1886, and was four weeks in bed. The attack was severe, she convalesced slowly, and was not able to leave the house until the following February. She had palatal paralysis, and regurgitated her food even in May and June, sometimes through the nostrils. In the middle of May her legs became weak, and in a fortnight she could not walk without help. Sensation in the lower extremities was greatly impaired, her appetite was poor, and she was pallid and nervous, shedding tears from slight provocation. When she was examined, on June 23d, the muscles of flexion and extension of feet and legs were still paralyzed. When assisted to the erect position she could not move her body forward or laterally, or recover the erect position if it were moved. Her voice was still nasal and food still regurgitated, but the eyes had recovered the power of accommodation, which had been lost. Möbius decided to employ Ling's system of movements. This treatment consists in mechanical stimulation of the affected nerves. The nerves are stimulated and made to vibrate by transverse frictions over them, made by the fingers, as the strings of a harp are made to vibrate. The following remarks are explanatory of this mode of treatment: "The nerve coming out of the axilla can be easily felt as a thick cord lying to the outside of the brachial artery. When the tips of the fingers are quickly drawn over it transversely, in the manner indicated above, a feeling is produced similar to that felt on electric stimulation. . . . It is essential that the tissues lying between the fingers and the nerve move with the former as if they were one; otherwise, the friction will never reach its destination, and the application then becomes useless. According to my own experience, the effects produced by this mechanical method are, so far as I can judge, (a) raising the nervous energy; (b) diminution of pain; (c) contrac-

tion of the smaller blood-vessels." Mary, whose case is related above, received this treatment four times between June 23d and July 2d, and the improvement was very marked, both as regards sensation and power of motion. On each occasion the treatment lasted from half to three-quarters of an hour. It was employed about three times each week with constant and rapid improvement until August 16th, when the patient was dismissed cured. The patellar reflex had not, however, returned, and Möbius states that this does not generally reappear until some time after the restoration of muscular power.

J. L. S.

PERTUSSIS.

In regard to the bacillus of pertussis, discovered by Afanassjew, Ssemtschenko, ²¹_{Nov. 22, 23} after much experimentation, comes to the following conclusions: 1. The bacillus of Professor Afanassjew is specific. 2. Bacilli may be found in the sputum about the fourth day of the disease, in some cases earlier. 3. They multiply in the tissues of the body, and as they increase the severity of the diseases increases. 4. The bacilli disappear before the entire cessation of the attacks of coughing, or when the paroxysms are reduced from two to four daily. 5. With complications, such as, for example, a catarrhal pneumonia, there is a great increase in the number of whooping-cough bacilli found in the sputum. 6. A pneumonia developing under these circumstances differs from ordinary attacks of catarrhal pneumonia. 7. The bacillus of whooping-cough is of value not only in etiology and diagnosis, but in the prognosis of the disease.

Treatment.—Inhalations and sprays of various antiseptic drugs would seem to be the most rational form of treatment. Insufflations of quinine, according to Swett, ⁵⁹_{v. 32, p. 14} following Forcheimer's method, have been very successful in his hands. In thirty cases, all under ten years of age, there was positive improvement after the morning and evening insufflation of the first day. Sulphur fumigation he also found of much service. Manby ¹⁵_{v. 41, p. 120} likewise reports great success from burning sulphur. His method is as follows: The children are in the morning put into clean clothes and moved elsewhere, all their clothes, toys, etc., are brought into their bedroom, and sulphur is burnt upon a few live coals in the middle of the room. The fire is allowed to remain in the room

five hours, and then the doors and windows are thrown open. The child sleeps in the room the same night. About twenty-five grammes (a little under an ounce) of sulphur to every cubic metre may be burnt; this is equivalent to rather more than ten grains (0.66 gramme) per cubic foot. The additional precaution was taken of having the day-room fumigated in a like manner during the night. The children practically lived in an atmosphere of diluted sulphurous acid gas for some days, while in several cases the process was repeated at the end of a week. Improvement was said to be immediate; the cough was lessened, the expectoration facilitated, and the paroxysms diminished in violence. Gelhert²⁷¹_{Jan.} and Mohr¹¹⁸_{p. 226} report in favor of this method.

Genser⁶⁴⁸_{pp. 908, 909} treated two hundred cases of whooping-cough by two methods: (1) insufflations into the nasal fossæ of medicinal powders, and (2) the administration of antipyrin by the mouth. In seventy-eight cases boracic acid was insufflated through a glass tube, and with moderate success, the average duration of treatment being forty-three days. The other cases were given antipyrin by the mouth, and the results were very satisfactory; it diminished the duration, number, and severity of the spasms of coughing, and in a majority of cases the treatment did not last longer than twenty-four days. The average dose was one and one-half grains (0.1 gramme) daily for each year of age.

Laborderie⁶⁷_{v. 114, p. 385} reports a complete cure in from twelve to sixteen days in eleven cases, although he lost a child of one year and one of three and one-half years from capillary bronchitis and pneumonia in these cases with forty to sixty attacks of coughing during the day. Antipyrin seemed to have no effect whatever. In one child the treatment had to be abandoned on account of nausea, diarrhœa, and gastric distress. He reaches the following conclusions: (1) Children take antipyrin without difficulty, and, as a rule, easily bear its effects; (2) the spasmodic condition is rapidly calmed, and in a few days the disease declines; (3) its action is so prompt and so free from accidents that it becomes a valuable remedy in a malady which may be of prolonged duration and give rise to many complications.

Geffrier³⁵_{p. 492} publishes a number of cases which go to show that antipyrin is efficacious in reducing the number and severity of the spasms. Griffith⁸⁰_{Feb.} and Jacques Bey²³²_{June 30} are among the observers

who favor its employment in this disease. Guaita,¹⁴_{p.120} in addition to its internal administration, employs insufflations of the drug into the nasal fossæ. The probable mode of action of this drug is that it diminishes the reflex excitability from the antiseptic properties of the drug.

Sonnenberger¹¹⁶_{p.303} considers antipyrin a specific in whooping-cough; he gives it in doses of about as many centigrammes (one-sixth grain) as the child is months, and as many decigrammes (one and one-half grains) as it is years old, three times daily, and the earlier in the disease it is employed the better the result. The author never observed collapse as a result of treatment. Anti-febrin acts far less favorably.

D'Heilly³⁵_{pp.340,383} treats this affection by insufflations of a powder composed of salicylate of bismuth, five grammes (77 grains); powdered benzoin, five grammes (77 grains); and sulphate of quinin, 1 gramme (15 grains), to be used five times daily.

Fervers³⁶⁶_{24.28, H.2} records the fact that, as a rule, the administration of quinine, preferably the hydrochlorate, shortens the duration and renders the course of the disease milder. It may be given hypodermically if impossible to give by the mouth.

Moncorvo, of Rio Janeiro, corresponding editor, advises the topical use of resorcin in the strength of a 1 per cent. solution, applied by a fine pencil brush to the larynx, and repeated every two hours. Guerra y Estape¹⁴⁵_{Oct.6} is of the opinion that resorcin gives the best results. Widowitz⁸⁴_{p.564} recommends the internal use of oxymel of squills. Guelpa⁶⁷_{Sept.15} favors the use of ac. carbol., resorcin, cocaine, and belladonna. C. R. Keyes²⁷¹_{Jan.} reports the shortening of an attack of pertussis and a lessening of severity of the paroxysms by the following:—

R. Ext. jaborandi, f3 1 (4 grammes).
Syr. simp., 3 2 (62 grammes).

M. Sig.: One teaspoonful every four hours and during the paroxysms.

Thomson²¹³_{May} has had no effect from the administration of nitric acid or ergot; but chloral hydrate in doses of five grains (0.33 gramme) every four hours for patients over two years, and two and a half grains (0.16 gramme) for those under that age, distinctly mitigated the severity of the paroxysms, but did not reduce their number.

Miller⁶⁰_{v.4,p.126} gives carbolic acid in doses of one minim (0.064 gramme) to children over five years; at three years, one-half minim (0.032 gramme) three times daily, the beneficial effects being noticed in two or three days. According to J. Mount Bleyer,¹⁰⁸_{loc.} peroxide of hydrogen is the most powerful and harmless antiseptic and antibacteriacide in existence; tests have proved it to be sixty times as powerful as carbolic acid, twenty times as strong as salicylic acid, and 40 per cent. more potent than the solution of bichloride of mercury. His plan of treatment is to spray the entire laryngeal space with the following:—

R Ch. Marchand's peroxide of hydrogen,
 15 vol. (chem. pure), $\frac{3}{5}$ 1 (31. grammes).
 Aquæ, $\frac{3}{5}$ 5 (155.5 grammes).—M.

After this he irrigates the anterior and posterior nasal space with

R Peroxide of hydrogen, $\frac{3}{5}$ 2 (62 grammes).
 Aquæ, $\frac{3}{5}$ 3 (93 grammes).—M.

Internally he gives glycozone, a compound resulting from the action of ozone on glycerine—one-half drachm (two grammes) every three hours in a little water to a child of two years.

Sequelæ.—Scheltema⁵⁸³_{v.1, No.3} records a case of acute nephritis occurring after whooping-cough in a child of two years. Alexander⁶⁹_{v.16, No.11} observed a case in which blindness came on suddenly after pertussis, the reaction of the pupil and the ophthalmoscopic image being normal. It was supposed that cerebral œdema existed between the corpora quadrigemina and the occipital region, which, increasing, produced cerebral compression and death. In another case of blindness after whooping-cough, the author discovered an optic neuritis with immobility of the pupil. In this case there was descending neuritis resulting from meningitis. On recovery the vision partially returned, but it then became evident that there was atrophy of the optic nerve. Möbius⁶⁸_{v.10, No.21} relates a case of paralysis in a child of six years, coming on six weeks after the onset of the malady. F. M. W.

MUMPS.

Metastasis.—Von Heubner¹²⁰¹_{May} states that in women with mumps œdema of the external genitals sometimes occurs, with swelling of the ovaries and enlargement of the inguinal lymphatic

glands. In males suffering from metastasis in mumps, orchitis occurs with hydrocele and subcutaneous œdema; sometimes there is a scanty urethral discharge. The patient complains of a vague ailing and dragging pains. Usually the right testicle only is affected, but sometimes a double orchitis occurs. When metastasis occurs the parotiditis subsides, and the metastatic symptoms increase in from three to six days. Recovery ensues in from one to two weeks. Von Heuber believes that mumps is an infectious disease, with multiple localization.

Abscess Following Mumps.—W. B. Keen^{190 June} prescribed for a patient with mumps on December 1st. In a few days the patient called to say that he had fully recovered, but soon after a painful swelling commenced in the region of the parotid, and on the 14th had reached the size of a hen's egg. On the 22d the tumor extended nearly to the clavicle and fluctuated. It was punctured in three places with the abundant discharge of fetid pus, followed by rapid recovery.

Mumps is believed to be a microbic disease, having an incubative stage which varies from nine to twenty-one days. Its clinical history indicates that it is a systemic infectious disease, but its specific principle has not yet been clearly demonstrated. Pasteur found in the blood rod-shaped bacteria one millimetre broad and two millimetres long, but attempts to inoculate animals proved fruitless. As evidence of its primary systemic nature, occasional cases have been reported in which orchitis preceded by a few hours the parotiditis.

Wm. T. Plant^{138 Apr.} says that orchitis is not rare in mumps, but he has never met a case of mastitis or vulvitis occurring as a complication. When orchitis occurs, the parotid swelling usually subsides. The inflammation of the testicle is announced by chilliness, high fever, pain and swelling, and often delirium. The sexual organs are more likely to be affected at the period of sexual development than at any other age. It is the popular belief that the orchitis leads to atrophy of the testicle, but this is probably an infrequent result, since writers do not mention it. The books state that metastasis in rare instances occurs to the meninges of the brain, causing speedy death. This event is so rare that few practitioners have, I think, ever met with it. In 1877 a young gentleman eighteen years of age, whose mumps had been treated

without the advice of a physician by cold applications around the neck, suddenly became alarmingly ill. The swelling of the parotid abated, and its subsidence was accompanied by the most intense headache, intolerance of light and noise, an axillary temperature of 104° F. (40° C.), and numbness and a pricking sensation in the legs; commencing tenderness was observed in the left testicle. The symptoms indicated metastatic meningitis, or encephalitis and orchitis in their incipency. The threatening symptoms were, however, soon relieved by twenty-five grain (1.62 gramme) doses of bromide of potassium and two-drop doses of the tincture of aconite-root, given every third hour, and the application of six leeches to the temples and the left groin. The patient made a good recovery. In uncomplicated cases the fever is usually moderate, and other symptoms so mild that no treatment is required except warm applications to the neck, as oakum or flannel. Plant says that Money, of London, advises the application over the swelling of equal parts of extract of belladonna, glycerine, and water, covered by flannel and oiled silk.

P. Vondersmith¹⁸⁶_{Nov.} states that he has treated mumps with good results by the following prescription:—

R Tr. gusiaci,	. . . . .	f 3 ½ (15 grammes.)
Ext. pilocarpini fl.,	. . . . .	f 3 3 (11 grammes.)
Glycerini,	. . . . .	q.s. ad 3 2 (62 grammes.)

Adult dose, one teaspoonful every four hours.

The average duration of the disease thus treated was six days. Recently a mild epidemic of mumps has occurred in New York city. Those treated without internal medication and by warm applications, as oakum or cotton-wool over the swelling have in several instances which I have observed recovered in as short a period as six or seven days, and without, so far as I am aware, any instance of metastasis.

Bouchut⁶²_{Aug. 16} has published the following aphorisms relating to mumps: Pain, with swelling of the parotid glands, in a child otherwise well, indicates mumps. Mumps lasts from five to eight days, and terminates by resolution. An epidemic influence of unknown character is the cause of mumps. Mumps occurs more frequently in boys than in girls. Pain in the testicles in boys, or in the breast in girls, occurring during an attack of mumps, marks the metastasis of the disease to the testicle or breast. Dry and warm applications suffice to cure mumps.

In regard to the parotiditis, which in reduced states of the system sometimes complicates various diseases of a severe type, Bouchut says pain with swelling of the parotid gland in a child suffering from fever indicates an attack of parotiditis, a form of mumps. Parotiditis almost always terminates in suppuration. The majority of children attacked with parotiditis die. J. L. S.

RHEUMATISM AND GOUT.

By N. S. DAVIS, M.D., LL.D.,
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ACUTE AND CHRONIC RHEUMATISM.

Etiology.—In the first volume of the ANNUAL, pp. 429, 430, the results of the investigations of Alfred Mantle were given, by which he demonstrated the existence of bacilli and micrococci in the blood of some persons affected with acute articular rheumatism, and also in the serum taken from the inflamed articulations. During the year just closed several communications have appeared in the medical periodicals giving the results of similar investigations. Popow²¹_{1897, Jan. 29}¹¹³ obtained micrococci from the blood of a person affected with acute rheumatism, propagated them by cultivation, and by inoculating rabbits claimed to produce well-characterized rheumatism in the animals, in whose blood and synovial fluid he found the same cocci. The micrococci were described as larger than those of erysipelas and easily stained with gentian-violet.

Jaccoud¹⁰⁰_{Aug. 21} asserts that acute articular rheumatism is not only a general disease, but generally an infectious disease. He refers to a treatise by Cornil and Babès, in which a case of acute articular rheumatism is related that proved fatal after the acute stage had passed, and revealed alterations in the cartilages of the right knee. There was no appearance of pus, but two varieties of microbes were present, one an elongated bacillus and the other a micrococcus. He also refers to two fatal cases recorded by Wilson, one from rheumatic pericarditis and the other from pericarditis and pneumonia. Bacilli were found in the pericardium in both and in the inflamed lung, but the affected articulations were not examined. In three cases referred to as having been observed by Pétrone, the serum obtained from the knee-joint, while affected with uncomplicated acute rheumatism, in each case showed microbes similar to those previously described by Klebs as found in rheumatic endocarditis. The foregoing cases, and especially those related by Popow and Pétrone, directly confirm the correctness of the observations

of Mantle as recorded last year, and render it probable that the serous effusions into the articulations, and the blood of persons affected with acute articular rheumatism, contain a variety of microbes. But whether any one of these microbes possesses specific etiological relations to the rheumatic disease, or whether they are identical with those found in the fluids and exudations connected with almost every variety of inflammation, cannot be decided until we have the results of a much more extended and varied series of investigations. In support of his theory that acute articular rheumatism is an infectious disease, Jaccoud relates two cases of infants born while the mothers were suffering with acute rheumatism. Both were born at full term and apparently well, but one of them twelve hours and the other three days after birth were attacked with fever, rapid pulse, and well-marked rheumatic swelling of several articulations. Under treatment, chiefly with salicylate of sodium, one child recovered in eight days and the other in little more than two weeks. Many of the cases adduced by Jaccoud and others, in support of the theory that microbes bear an essential etiological relation to acute articular rheumatism and that the disease is infectious, present visceral complications, and are in subjects with prior specific or special diathesis or predispositions, as in the case cited from Guttman.

Pathology and Pathological Changes.—At a meeting of the London Medical Society, April 9th, Angel Money ⁶_{Apr. 11} read a paper on the pathology of rheumatism, in which he claimed that suppuration never occurred in purely rheumatic disease. "When pus was found in the course of acute rheumatism it was due to a combination of the rheumatic with the septic poison." In the discussion that followed the reading of the paper the same position was sustained by Sir William MacCormac and Dr. Ord.

The paper contained the results of a systematic investigation concerning cutaneous sensibility in acute rheumatism. The author had "found that over the inflamed joints the acuteness of tactile sensation and of pain was increased; the power of localization was undisturbed, increase not being discoverable by the æsthesiometer; complete analgesia was at times a marked phenomenon, and might be associated with hysteria; sensation of cold was usually diminished, that of heat exaggerated; faradic sensibility was diminished or even completely abolished." This was most noted

about the affected joints, but sometimes over the whole limb. Sir William Gull stated that rheumatic perspiration often varied in reaction in different tracts of the skin of the same subject. He also mentioned a case of rheumatic fever associated with lactation, in which the application of belladonna to the breasts was followed by glycosuria. Dr. Money's theory of the pathological development of rheumatic disease appears to be, first, a toxic condition of the blood from an excess of "fatigue products," or elements resulting from nitrogenous tissue metamorphosis; and, second, the irritative action of these products on those portions of the vasomotor and trophic nervous systems connected with the fibrous structures of some parts of the body or extremities, by which local vascular hyperæmia is induced with its associated phenomena, heat, tumefaction, and pain. If we admit the correctness of the first factor in the development of active rheumatic disease as here mentioned, it is reasonable to suppose that the autogenetic poison might vary in its special qualities and in its action upon particular portions of the nervous system, in accordance with the varying diathesis or predisposition of the individual. It is, doubtless, the modifying influence of the scrofulous, tuberculous, and syphilitic constitutional conditions, as well as of the co-existence of certain fever infections, that increases the number of cases of visceral rheumatism and occasionally determines the development of suppurative processes. Many cases illustrating these influences have been reported during the past year by Briquet,²²⁰ Jaccoud,^{177 212 14} Lejars,¹⁴ Potain,¹⁰⁰ and Marfan.¹⁰⁰

But few cases have been reported illustrating structural changes not previously familiar to the profession. Homan, of St. Louis,⁸⁵ relates the case of a man, aged eighteen years, affected with subacute rheumatism in the muscles of the left leg, extending from the hip to the ankle, which continued with varying degrees of severity for several weeks. In the latter part of the sickness the calf of the leg was unusually tender to the touch, and a hard lump or nodule was found apparently in the muscular substance, which subsequently diminished slowly, accompanied by marked atrophy of the muscular fibres.

In a paper communicated to the Royal Medical and Chirurgical Society by Archibald Garrod,⁶ it is claimed that the appear-

ance of nodules and muscular atrophy does not depend upon the intensity of the rheumatic disease. Both have been seen in connection with the most simple hydrarthrosis, and are generally accompanied by marked increase of the reflexes, suggesting an excessive excitability of the spinal cord. Similar views have been expressed by Charcot and Parisot.

Lindmann⁶⁹_{p.119} relates two cases of acute articular rheumatism, one in an adult, the other in a child, in the course of which numerous nodules appeared rapidly, with an increase of some of the rheumatic symptoms. The nodules are described as numerous, about the size of a pea, hard, movable under the skin, and somewhat painful, but with no redness on the surface.

The nodules disappeared with the establishment of convalescence from the rheumatic affection. The author, in reviewing the literature of the subject, collected fifty-nine cases, a majority of which were in females, and forty-six were children. The nodules are represented as usually appearing suddenly in the later periods of the rheumatic disease, varying in size from that of a pin-head to that of an almond, and remaining from a few days to a month or longer. Microscopical examination⁵_{Oct} shows them to be composed of newly formed connective tissues of the inflammatory type.

Mayet and Cuilleret²¹¹_{Apr. 20} report two cases of nodular rheumatism accompanied by contraction and atrophy of certain muscles of the extremities following acute arthritis. Some muscles of the trunk were also affected. Electricity afforded no proof of trophic degeneration, neither did they think the results could have been produced by exaggerated reflex excitability of the spinal cord, but rather by true myelitis in connection with constant peripheral irritation.

Several articles have appeared in the medical periodicals concerning that chronic form of rheumatic disease called *arthritis deformans*, two of the most interesting by Paul Wagner.³¹_{Mar. 20, 22} Nearly all the writers incline to the belief that this peculiar disease has its origin in the lateral cornua or trophic tracts of the spinal cord, but they afford no additional proof from direct study of the supposed lesions of the cord itself; neither do they add to our knowledge of remedies for its successful treatment.

Treatment.—The progress made in the management of cases of acute and subacute rheumatism during the year has chiefly

consisted in the more extended clinical observation concerning the effects of the various remedies that had been brought to the notice of the profession during the three or four preceding years. Such additional clinical experience enables us to determine more accurately the value of each remedy, and its adaptation to the treatment of the several grades and stages of rheumatic disease.

Early in the year Thomas Whipham,² analyzed six hundred and fifty-five cases of acute rheumatism, embraced in a report of the Collective Investigation Committee of the British Medical Association. They had been reported to the Committee chiefly by country practitioners. Of the whole number of cases 80 per cent. occurred between the twentieth and fortieth years of age, only thirty-two having occurred in children under ten years. In the treatment of the six hundred and fifty-five cases, seventeen different combinations of medicines were employed, in fourteen of which salicin compounds entered as an important part. The largest number of cases were treated with the salicylate of sodium or potassium, with the following results: Average duration of the fever, 8.65 days; of the pain, 10.18; and of the whole attack, 19.03 days. The salicylates and other compounds of salicin were used in the treatment of five hundred and thirty-six cases with only twenty-two failures. Of the whole six hundred and fifty-five cases treated, twenty-two died, chiefly from cardiac complications, and there occurred seventy relapses.

Salol, being one of the later of the salicin group of remedies reported on last year, has been used still more extensively since. In doses of from three to six decigrammes (five to ten grains) every two hours it has generally speedily relieved the fever and pain in the early stage of acute cases. J. Rose Bradford,⁶ while acting as house physician to Dr. Ringer, in the University College Hospital, carefully noted the effects of salol in the treatment of sixteen cases of rheumatic fever. When the remedy was given in six-decigramme (ten-grain) doses every hour, in a large proportion of the cases the temperature was decidedly reduced in from twelve to eighteen hours, but the pains in the affected articulations persisted for twenty-four hours later, and in some cases until salicylate of sodium had been added in the treatment. While he thus found the salol fairly efficacious in relieving the fever and pain of these sixteen cases, it was no more so than the salicylate of sodium

had proved to be in similar cases. Relapses were as frequent as after the treatment with the salicylates, and though ringing in the ears and deafness did not occur as often, yet both were well marked in several cases. In some of the cases, while taking the salol in six-decigramme (ten-grain) doses every hour, salicylic acid was detected in the urine at the end of the first day; on the second day, or commencement of the third, the temperature had fallen to the normal, there was decided deafness and nausea, and considerable carboloriæ. Dr. Bradford's conclusions were, that the efficacy of the salol in the treatment of rheumatic fever depended upon the salicylic acid it contained, while the carbolic acid in its composition only served to render its taste less disagreeable and its presence in the stomach less offensive.

Aufrecht, of Magdeburg,⁶⁹ who appears to have had a large experience in the treatment of rheumatism, gives an interesting summary of his conclusions regarding the value of salicylic acid, the salicylates, and salol, and gives decided preference to the salicylic acid in the treatment of all cases of acute articular rheumatism during the first two days. He gives the remedy at the rate of six grammes (90 grains) per day for two days, during which he says the pain and fever disappear, when the doses are reduced one-half, at which rate they are generally continued eight or ten days. He admits that using the drug to this extent often produces burning in the stomach, sometimes vomiting, tinnitus aurium, or dyspnœa, requiring the substitution of some other remedy. In such cases he finds salol the best substitute, giving it in the same doses as the salicylic acid. In his later experience he has given the salicylic acid the first two days, and then substituted the salol for the remainder of the treatment. In the treatment of chronic articular rheumatism Aufrecht prefers the salol on account of the necessity for continuing the use of remedies a much longer period.

Jaccoud,²⁴ claims satisfactory results from the treatment of acute rheumatism with the salicylates of sodium and potassium, except in cases presenting symptoms of hyperpyrexia or visceral complications, in which he regards them as useless. In the latter class of cases he uses large doses of tartar emetic, from three to four decigrammes (5 to 6 grains), every four or six hours. In other cases in which, under the influence of the salicylates, the pain ceases, but the temperature continues high or but little

reduced, he claims good effects from the use of the hydrobromate of quinine in doses of twenty-five centigrammes (4 grains) every six hours.

Donald W. C. Hood⁶, read a valuable paper before the Medical Society of London, giving a full analysis of more than two thousand cases of acute rheumatism treated in Guy's and St. Bartholomew's Hospitals, eight hundred and fifty of them having been treated at Guy's before the salicylates had been introduced as remedies in this disease, thus affording a wide field for comparison. After a most careful and detailed examination of the records, his conclusion is that while salicyl compounds are, as a general rule, effectual for obtaining early relief from pain and reducing temperature, they exert very little or no influence over the duration of the disease. He coincides with Jaccoud's statement that they have no control over cases of hyperpyrexia, and should not be given when the nerve-centres are involved.

From an impartial review of the literature of rheumatism, as developed during the year 1888, I feel justified in presenting the following conclusions: (1) while several investigators have discovered both bacilli and micrococci in the blood and the serous fluid in the joints of patients affected with rheumatism, their etiological relations are not determined, and no other advances have been made concerning the etiology of the disease; (2) the additional clinical experience gained in the use of the group of new remedies, of which the salicin compounds are the most important, tends strongly to the conclusion that their beneficial effects depend entirely upon their analgesic and antipyretic properties; and hence their usefulness is limited to the early relief of pain and moderate reduction of temperature, while for the completion of the cure and the prevention of relapses the same diligence must be used in the administration of older and well-known remedies for the correction of excessive acidity and the restoration of natural secretory actions, as though no salicyl remedies had been given; (3) the additional number of cases that have been reported in which such large doses of nearly all the new analgesic and antipyretic remedies have produced either extreme gastric irritation or alarming depression of the nervous functions should make the practitioner specially cautious in attempting to follow the example of Aufrecht in so rapidly saturating his patients with any member of this class.

GOUT.

Etiology.—Contributions to the literature of gout during the year 1888 have been neither numerous nor of decided importance. They have added nothing to our previous knowledge concerning the causes of the disease, either predisposing or exciting.

Hereditary influence, free indulgence in nitrogenous or animal food and fermented drinks, and insufficient physical exercise are quite uniformly named as the chief predisposing causes, and the presence of an excess of uric acid or urate of sodium in the blood and tissues as the direct exciting cause. In his thesis for the degree of M.D., in the University of Oxford, A. Haig²_{July}, gives the results of investigations conducted by himself, which not only confirm the general opinion that uric acid and urate of sodium are the direct exciting causes of gout, but also of many cases of migraine, neuralgia, melancholia, and some cases of epilepsy. He also demonstrates by repeated experiments that the production and elimination of the urate of sodium is influenced both by food and certain drugs. When the diet was chiefly of meat or animal food the elimination was diminished, causing the urates to accumulate in the system, while the reverse occurred under a vegetable diet.

Pathology and Pathological Changes.—At a meeting of the Société de Biologie, of Paris, Leven⁵⁰_{May} contended that gout was not a primary disease, and that the seat of morbid action was in the nervous centres, more particularly in the brain, the spinal cord, or the solar plexus. He freely admits the influence of the uric acid and urates as exciting causes, but refers their action primarily to the nervous centres rather than to the abdominal viscera and articulations, and, therefore, advocates classing gout with the neuroses. In a communication made to the Lyons Medical Society,¹⁴_{Nov.} Mollière explains the reason why persons affected with gout so rarely become tuberculous, and why some patients with tuberculosis have had that disease decidedly checked on the supervention of an attack of gout. His suggestion is that uric acid and urates are antagonistic, not only to the pyogenic micro-organisms, but to the bacillus tuberculosis also. Probably the same antagonistic properties are possessed by the lactic acid and lactates, and hence the non-suppurative tendencies of all grades of true rheumatic inflammation.

As illustrative of the structural changes that sometimes take place in the progress of gout, Hudelo presented to the Society

Anatomique, of Paris, ¹⁴_{No. 12} the results of an autopsy on a patient who had died from gout in the Hôpital de la Pitié, in the service of Troisième. In the upper extremities tophi existed in the right hand at the base of the metacarpo-phalangeal articulations of the index, medius, and ring fingers, and also at the base of the articulations of the second and third phalanges of the index and medius, and at the base of the thenar eminence. An incision through the integument near the thenar eminence exposed a soft, pulpy substance infiltrating between the muscles, and at the level of the fingers it filled the sheaths of the tendons without communicating with the articulations. By extending the incisions the uratic infiltration was found in the tendon sheaths of the palm and of the back of the hand. The articular cartilages of the phalanges and the metacarpal phalanges were covered with a whitish layer of urates. The periarticular bony contour was uneven, ragged, and in places presented osteophytic projections. The lesions were greatest at the basis of the radio-carpal articulation. At the right elbow a subcutaneous tophus of the size of a hen's egg filled the olecranon pocket. The elbow-joint was filled with a mixture of synovia and urates. The hand, wrist, and elbow of the left upper extremity presented pathological and anatomical changes very similar to those described in the right. In the lower extremities, the phalangeal, metatarso-phalangeal articulations of the tarsus and metatarsus of both feet were affected in the same manner as the corresponding parts of the upper extremities, the uratic infiltrations being most prominent in the articulations of the right great toe. Both knee-joints were filled with the uratic or cretaceous deposit; the articular surfaces of both tibia and femur were diseased, their contour rough and irregular, with large osteophytes attached to the femurs. The surfaces of the patellas were also rough with osteophytic projections. The organs in the cranium and the thorax were natural except the heart, which was large, its walls pale and thin, with dilated cavities but without valvular deposits. Of the viscera of the abdomen, the liver was harder and more granular than natural, the pancreas contained a whitish substance resembling the uratic infiltration but not crystalline, and the kidneys were enveloped in an excess of fatty tissue, notably diminished in volume, the capsules easily removed, leaving the surface uneven but with no appearance of cysts. Incisions showed marked atrophy of the

parenchyma inclosing some fatty tissue. In the centre of the papilla was a series of whitish layers parallel to the collected tubes of the pyramids, but not extending more than six or seven millimetres into the parenchyma.

The subject had been long addicted to the excessive use of alcoholic beverages. The most important contribution to our knowledge of the pathology of gout during the year has been made by Walter Mendelson, of New York, ⁵ giving the results of his investigations concerning the guanin gout in the hog and its relations to the sodium urate gout in man. After alluding to the discovery of guanin gout in the hog, Dr. Mendelson explains that guanin is one of the nitrogenous crystalline bodies resulting from tissue metamorphosis, composed of $C_5H_5N_5O$, and chemically belongs to the same class as xanthin and uric acid, and is generally found in union with a small proportion of carbonate of calcium. The part of the hog from which Dr. Mendelson obtained his specimens for investigation was the ham, including the knee-joint, with parts of the femur and tibia and fibula, with the fleshy attachments. In dissecting these parts he found discrete, chalky-looking masses of guanin, a few square millimetres in area, between the epiphysis and shafts of the bones; numerous flat, scale-like deposits on the periosteum, and the same more abundantly in the ligaments and periarticular tissues; while within the joint guanin was found in the cartilages and in the fibro-cartilages forming patches much resembling the deposits in human gout. The deposits were within and not upon the surface of the cartilages. In the muscles the deposit was found abundant in the intramuscular septa, lying between the layers of connective tissue composing the septa; none was found penetrating the muscular fibres and none in the fat or skin. He represents the guanin crystals in the various structures as united to some proteid body, derived from the tissue in which it is placed, and says: "It is this colloid material, insoluble in acids, but soluble in alkalies, which determines the acicular form and radiate arrangement of the crystals in the tissues, not only of guanin, but also of sodium urate, as the investigations of Rainey, Ord, Van Dyke Carter, and others have shown." To show the influence of the presence of a colloid on the crystalline form he dissolves "a particle of the guanin nitrate upon the slide and leaves it for spontaneous evaporation, when the salt crystal-

lizes in long, flat, pale-yellow, oblique rhombic prisms, of the monoclinic system," as shown in Fig. 1.

By treating a particle of the guanin on a slide with ammonium hydrate, and covering it with a test-tube to prevent evaporation, the ammonia slowly dissolves the colloid as well as the guanin, and on allowing the evaporation to take place the guanin appears in colorless, biscuit-shaped sphero-crystals, which are well shown in Fig. 2. The guanin found in the muscles was uniformly found attached to fibres of connective tissue, and when pressed out in glycerine or water it appeared fibrous in structure, but consisting of fine, short, hair-like crystals in parallel bundles or in radiating groups, as shown in Fig. 3. The presence of the guanin crystals appears to cause the degeneration or necrosis of the tissue-fibres included within the area of crystallization, as



FIG. 1.
(*American Journal Medical Sciences.*)

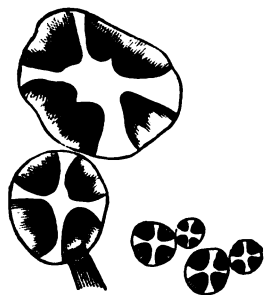


FIG. 2.
(*American Journal Medical Sciences.*)

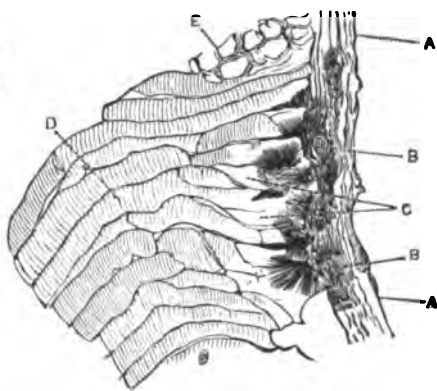


FIG. 3.
(*American Journal Medical Sciences.*)

is also the case in gout in man; but no evidences of inflammatory products or changes were found in the specimens examined.

To illustrate the minute structural changes in the affected

articular cartilages, a section was made through the masses in the cartilage of the lower end of the femur in such direction as to include also a portion of the bone. Such section is shown in Fig. 4, in which the guanin may be seen occupying the medullary spaces of the bone, and from these extending upward until it invades the cartilage. The author gives good reasons for claiming that the deposit commences first in the bone and spreads to the cartilage secondarily. He also points out the same molecular degeneration in the bones and cartilages as was described in the muscles. No deposits were found in the bone outside of the medullary spaces, and none in any part of the vascular system except

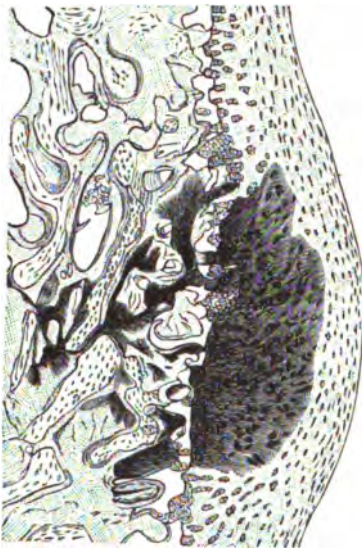


FIG. 4.
(*American Journal Medical Sciences.*)

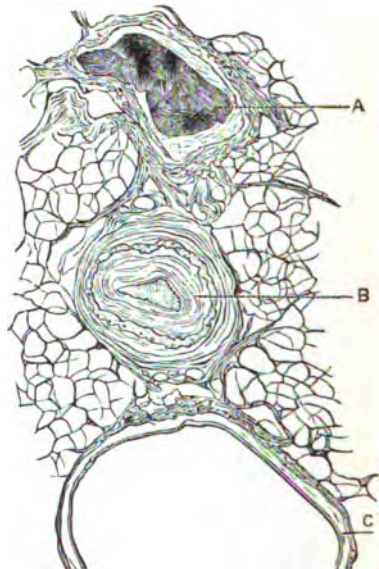


FIG. 5.
(*American Journal Medical Sciences.*)

in the smaller veins, some of which were found completely filled. A section through an intermuscular fibrous septum, containing a small artery and two venæ comites, one of which is partially filled with guanin deposit, is well shown in Fig. 5.

It will be seen from this brief notice of the investigations of Dr. Mendelson, and still more by a perusal of his entire paper, that he is fully justified in claiming a very striking resemblance between the mode of deposition and the tissue changes in the gout of human beings and those he has described in the ham examined, and fully warrant the title "guanin gout," as given by Virchow in 1866.

DIABETES MELLITUS.

By JAMES TYSON, M.D.,

PHILADELPHIA.

Etiology.—Few contributions of importance bearing on the etiology of diabetes mellitus have appeared during the last year.

William Pepper¹²¹_{Feb.} calls attention to rapid eating or bolting of food, with imperfect mastication, as a cause in persons who are predisposed to the disease; also the absence of good teeth as a factor in favoring such conditions of malnutrition. Mosse, Charles Blanc, and others³_{Oct. 10} claim that among the causes of diabetes must be included malaria, while Emil Schnée⁵⁷_{Sept. 20} emphasizes inherited syphilis as an etiological factor. Teschemacher, of Neuenahr,⁵⁷_{Sept. 20} has reported a case in which acute gastric catarrh seems to be the immediate cause of glycosuria. The patient was a man in the prime of life, who accompanied his wife to Marienbad for treatment, and soon after his arrival ate a meal of new herring. There succeeded suddenly an extreme thirst, associated with acute gastric catarrh, and sugar appeared in the urine, but soon disappeared. In the course of the winter there developed a moderate chronic gastric catarrh with acute exacerbations, and the urine was found to contain as much as 1 per cent. of sugar, which disappeared, with abatement of the symptoms. Twice did the sugar return, being again induced by a meal of new herring. At this time the sugar contained 2.8 per cent., and again disappeared completely with improvement in the other symptoms.

Pathogenesis.—Abeles having claimed that if the blood of the hepatic vein be removed by catheterization through the jugular vein it will be found that there is no increase in the sugar of that blood above that of the portal vein, Seegen,⁸⁴_{July 21} in turn, following the method pointed out by Abeles, still finds a difference of 0.4 per cent. in favor of the blood of the hepatic vein as compared with that of the portal vein or carotid artery. This corresponds, according to Seegen, to a sugar formation in the liver equal to 85.8 grammes in twenty-four hours. These results were obtained under

chloroform narcosis, but in non-chloroformed animals he found the difference more than twice as great; whence it may be fairly inferred that chloroform narcosis inhibits sugar formation in the liver, rather than that pain or shock stimulates it, as has been asserted. The same is true of curare. So, too, Seegen claims to have shown, in his more recent experiments, that ligation of the vena cava has no effect in increasing the sugar capacity of the hepatic vein. On the other hand, he claims that Stricker's method of catheterization produces another derangement in the circulation of the liver, as the result of which a part of the blood of this organ flows back through the vena porta and renders the blood of the latter richer in sugar.

Seegen's chief results are thus formulated²_{may}: 1. The formation of sugar is a normal process, going on in the liver uninterruptedly. 2. The daily amount of sugar formed in the liver is very considerable. 3. This sugar is continually "converted" in the body, but where and in what way has not yet been explained. 4. Sugar or carbohydrates taken as nourishment do not participate in the formation of sugar in the liver. 5. Albumen and fat are the materials from which the liver forms sugar. 6. The formation of glycogen in contrast to liver sugar is intimately related to the kind of nourishment taken, and is greatest when cane-sugar is taken.

Comparing these facts with those derived from clinical observation, he notes that the disease occurs in two forms: In the first of these, the mild form, the patients are usually well nourished, belong to middle life, and voracity, thirst, or polyuria are seldom excessive. In the second, or severe form, the patients are usually young, lose flesh rapidly, and have great voracity and thirst, with large polyuria. The main difference in the two forms lies in this, that the patients of the first class only excrete sugar when they take sugar or carbohydrates in their food, the symptoms of diabetes ceasing when these are discontinued. In the second class the sugar is scarcely influenced by the avoidance of sugar. Seegen believes that these two different forms represent two distinct pathological processes. In the first the excreted sugar is derived undoubtedly from the sugar ingested, and the diabetes must be regarded as the result of the incapacity of the liver-cells to dispose of the carbohydrates in the normal manner; in the second form it

must be assumed that the normally formed liver sugar is excreted. The whole body, or more or less of its elements, has not the capacity to "convert" the sugar conveyed in the blood, hence the graver prognosis in this form. The ultimate cause of diabetes is still unknown, but Seegen is inclined to believe that nervous derangements underlie the disease.

In the last ANNUAL attention was called at some length to the experiments of von Mering in producing glycosuria with phloridzin. At that time we had no information as to the nature of phloridzin. In a further contribution of von Mering ¹¹⁴_{M. 14, H. 1, 6} we are informed that it is glucoside discovered in 1885 by von Koninck in the bark of the roots of apple, pear, cherry and plum trees. It forms silky, shining, needle-like crystals, which are soluble in a thousand parts of cold water and in any proportion in hot water; in alcohol they are also easily soluble, in ether scarcely at all. The solutions of phloridzin in alkalis absorb oxygen and become reddish brown; with chloride of iron they assume a dark brownish-red color. Phloridzin rotates light to the left; on boiling in dilute acids it breaks up into two substances, phlorosis and phloretin. $C_{21}H_{24}O_{10} + H_2O$ (phloridzin) = $C_{15}H_{14}O_5$ (phloretin) + $C_6H_{12}O_6$ (phlorosis). Phlorosis is a kind of sugar which possesses the formula of grape-sugar, $C_6H_{12}O_6$, and behaves in general as this does. It ferments directly, reduces alkaline copper solutions in the same manner as glucose, but shows a smaller rotatory power and does not produce crystalline anhydrides. Phloretin forms small plates almost insoluble in cold water, but easily soluble in ether. On boiling with caustic potash, phloretin breaks up into phloretin acid, $C_9H_{10}O_3$, and phloroglucine, $C_6H_6O_3$.

Continuing his studies of the effects of phloridzin upon dogs while feeding and while fasting, upon dogs fed upon nitrogenous and non-nitrogenous foods including fat, and upon birds deprived of the liver, von Mering has reached the following conclusions:—

The albumen metabolism, when the animal is sufficiently nourished upon fat or a mixed diet, is not increased under the use of phloridzin, notwithstanding considerable quantities of unoxidized sugar appear. Very different is it with fasting animals, wherein phloridzin, besides causing diabetes, produces also a decided increase in albumen metabolism. The increase may equal 30, 50 and even 100 per cent., while if the hungry animal receives a large

amount of fat the phloridzin causes only a small increase in albumen metabolism.

These results, apparently antagonistic, are, according to von Mering, easily explained: During a sufficient supply of food, phloridzin, notwithstanding the fact that a considerable quantity of unconverted sugar is excreted with the urine, does not increase the albumen metabolism, because in the presence of such sufficient food supply the non-conversion of sugar, even in large quantities, does not influence the nitrogenous excretion.

Very different, on the other hand, is the tissue metamorphosis in fasting, when the organism lives upon itself. Here, in consequence of the non-conversion of sugar, which arises from the breaking-up of albumen, and which, in ordinary conditions, in its combustion lays up albumen and fat, and especially albumen, there is, instead, an enormous demand for albuminoids, which are taken from the albumen of the body. Through the scanty and often totally absent oxidation of sugar, the tissue metamorphosis is greatly altered and the albumen metabolism considerably increased. The albumen destruction in the body is greater the longer the animal has fasted, and therefore the less its stock of carbohydrates. These results v. Mering regards as in accord with the tissue-change experiments on diabetics which he has already published.

Lancereaux continues to hold that certain forms of diabetes with symptoms more or less distinct are the result of *lesions in the pancreas*. He reports four cases ¹⁵²_{May 1} with autopsies, in which there were pancreatic lesions, and of fourteen cases observed by him in all two had calculous obstruction of the pancreatic duct, one had obliteration of the same duct without known cause, nine had acute or chronic disease of the pancreas similar to the change in atrophy of the liver, two had sclerosis of the organ with dilatation of the pancreatic duct. Three classes are made: First, an acute form, sudden in its occurrence, attended by thirst, accompanied with polyphagia, polyuria, and glycosuria, pruritus, rapid emaciation, progressive loss of strength and sexual desire, together with notable change in the disposition of the patient. These are followed by derangements of general nutrition, dryness of the skin, falling of the hair and teeth. Furuncle and carbuncle were observed in a single case only, cataract appeared in three cases. The termination is usually by diabetic coma or tubercular consumption, and

disorders bordering on gangrene. Tuberculosis, according to Lancereaux, was the cause of death in nine cases out of fourteen. He has observed also, in connection with changes in the pancreas, hypertrophy of the duodenal glands. The prognosis is unfavorable and course generally rapid. The second form, which he calls fatty diabetes, is more slow in its origin and the appearance of all its symptoms. There is increase rather than diminution of the patient's flesh. There is more apt to be an involvement of the articulations. Death is less commonly due to diabetes than to the affections which accompany it, viz.: furuncle, anthrax, etc. In a few of these cases death is the result of tuberculosis. There is apt to be biliary lithiasis, arterial sclerosis, periarticular osteophytes—all alterations which suggest the question whether the diabetes is not a symptomatic form of a general malady to which should be referred all the disorders in question. In addition to the two types there is a third, which presents neither the pancreatic involvement of the first nor the obesity of the second, and characterized by a development intermediate between the two. It is due to derangement of the nerve-centres, either traumatic or emotional, and is often the result of accident. It is mild in its symptoms. There are no pathological changes discovered and it is almost never accompanied by gangrenous accidents. The prognosis is relatively favorable.

J. Hesse⁴_{May}, also reports a case of death from diabetic coma in which, at the autopsy, the pancreas was found degenerated into a mass of connective tissue save one piece about the size of a bean, which was normal. The duct was calcified, with sinuous dilatations.

H. Barth⁷_{May} reported to the Society of Anatomy a case of diabetes accompanied by bronzing of the skin, pigmentation and hypertrophy of the liver, pigmentation and enlargement of the pancreas, pigmentation of the mesenteric glands, similar to the cases published during the past year by Hanot, Chauffard, Letulle, and Brault under the name of *pigmentary cirrhosis of diabetes*. The liver was enormous, weighing thirty-seven hundred grammes, normal in shape, uniformly hypertrophied throughout; there was no perihepatitis; the surface was uneven, very granular, especially in the neighborhood of the anterior border. The trabeculæ of connective tissue between the lobules were thickened. The pancreas, though enlarged and pigmented, was not sclerosed; in other

words, seemed to be the seat of true hypertrophy. In the discussion which followed there seemed to be a decided disposition to attribute this form of diabetes to alcohol.

S. R. Hermanides⁸⁹ reports four cases of *brain lesion* and diabetes in a person struck by lightning, who had at the end of the year diabetic symptoms which continued until death. After two years of right-sided hemianopsia, and six weeks before death, as was the case also for almost three weeks after the accident, there were vasomotor derangements in the left leg. At the autopsy the dura mater was found thickened over the hemispheres and in many places glued to the pia mater. The latter was turbid and in several places glued to the cortex, while in the sulci here and there there was an exudate. These alterations were more distinct on the left side than the right and mostly on the parietal lobes, although other parts were not free. In the left occipital lobe all the convolutions were softened. The brain was otherwise normal and the optic tract sound. The writer referred the pain in the head and derangement in the right leg to the inflammation of the brain, the hemianopsia to softening of the occipital lobe, and the diabetes to the cortical lesions. He says, further, that all cases of diabetes are referable to affections of the nervous system and that diabetes is primarily a nervous disease. In proof of this he quotes Bernard's puncture, numerous autopsies, the etiology of the disease, the numerous neuralgias which precede or accompany it, and, finally, the derangements of nutrition in diabetes, the abscesses and boils, which he ascribes to sugar-charged blood or to lesions of the vasomotor trophic nerves.

Age.—W. H. Deane⁹⁰ reports a case of diabètes in a child three weeks old. The case came under observation November 20, 1887, evidently soon after the disease began, and died January 4, 1888, with well-marked diabetic coma.

G. Heinricius¹¹⁸ reports diabetes in a child three and one-half years old. The child was emaciated, had lost its appetite, and complained of great thirst. Frequent micturition was accompanied by severe pain in the umbilical region. The child came under observation on the first day of June. Under diet and Carlsbad water and iron the sugar diminished greatly, but on the night of the 7th of June it was seized with vomiting and abdominal pain, and died in three hours.

Symptomatology.—Leube²⁰ reports that he has found *glycogen* in the urine of a diabetic in the following manner: The specimen of urine was placed directly in absolute alcohol, the precipitate collected, dried, and treated with distilled water. This was repeated until the watery extract was quite free from sugar. The glycogen was then recognized by iodide of potassium or by conversion into sugar by boiling with sulphuric acid and neutralizing.

Fütterer³⁴¹_{v.28, H.2, 3} also demonstrated some preparations from a patient dying of diabetic coma, in which, by Ehrlich's iodized gelatine, glycogen was shown. He found it more particularly in the renal epithelium and the capillaries of the brain cortex, and to a slight extent in the liver.

Treating of the relation of diabetes to *affections of the nervous system*, Auerbach³²⁶_{M.41, H.4, 6} says that various psychical disorders and a form of insanity allied to melancholy may occur in diabetic subjects, and a neurotic family history is frequently found; but when both insanity and diabetes are inherited it is seldom that they affect the same individual, and when they do it need not be simultaneously. A case is related of a family where the father died of insanity and the mother died of diabetes. Of eleven children, four escaped either disease, one died insane, one recovered from an attack of melancholia before showing any signs of diabetes and died of diabetic coma. Of the remaining children, three suffered from melancholia, one from hypochondriasis, and one from diabetes. Some of the members of the third generation had melancholia and some diabetes.

The same author refers to a peculiar hyperæsthesia affecting the soles of the feet, thereby seriously interfering with walking, observed by him and others in the neuritis of diabetes. As the quantity of sugar diminished the neuritis improved. On neglecting the diet a relapse occurred, and, in addition to the previous symptoms, a paralysis of the face, whence the importance of examining the urine in neuralgia.

The relation of diabetes to *tabes* is also referred to from the fact that certain symptoms are common in the two affections. In diagnosing *tabes* we have to rely on a history of syphilis, the girdle sensations, lancinating pains, and the Argyll-Robertson pupil phenomenon. The presence of symptoms of *tabes* without glyco-

suria, extending over several months, will exclude diabetes. In a doubtful case the probability would be in favor of diabetes, for glycosuria is rare in tabes, much rarer than ataxia and loss of knee-jerk in diabetes, although Bouchard and Rosenstein found the knee-jerk frequently absent, while Althaus and others have observed an ataxic gait and inco-ordination of the arms.

In a paper before the British Medical Association, at its session in Glasgow in July, Pavy²_{Aug. 18} said, alluding to *nervous symptoms* in association with diabetes, that they included pain, often referred to neuralgia, rheumatism, and sometimes even gout. Referring to ataxic symptoms, he was satisfied that certain symptoms of nerve action especially connected with the spine were apt to occur in diabetes, and he had for some time considered that there was some relation between the two. They sometimes come on together, and sometimes attacks of the ataxy come on with diabetes. Frequently there are deep-seated pains, and these are often worse at night. He was inclined to regard these symptoms as due to a condition of the spinal cord, and he had found it associated with a milder form of diabetes after middle life. Pavy had not found a single case that resisted the iodide of potassium. In the ANNUAL of 1888 this association of nervous symptoms with diabetes was alluded to at some length, but the treatment recommended by all writers quoted was the treatment for diabetes, to which the ataxic symptoms yielded as the glycosuria diminished.

In a paper on "Ocular Disturbances in Diabetes," read before the Cincinnati Medical Society, George H. Goode⁵³_{Oct. 29} regards the changes which take place as functional and organic. As boils and carbuncles are apt to occur on various parts of the body, so they may occur in the region of the eyelids coincident with the same affections elsewhere. Suppurative keratitis may occur, but sloughing of the cornea is probably not more common after the extraction of diabetic cataract than after the same operation on the eyes of healthy individuals. Iritis is sometimes present, the pupil is frequently dilated, and the muscle of accommodation is sometimes affected; hence premature or rapidly advancing presbyopia, so that glasses must soon be necessary and followed by stronger ones. The external optical muscles may be affected, and of these the rectus most frequently. The turning of the eye outward is limited to a greater or less degree, and, as a consequence, the patient com-

plaints of diplopia when the object is moved in the direction of the affected muscle. But the most interesting of the ocular phenomena is cataract, and the development of this condition in the eye, whenever present, should suggest an examination of the urine. That the presence of sugar in the blood is capable of developing opacity of the lens was shown long ago by S. Weir Mitchell, but the precise mechanism is not understood. More recently it has been suggested that there was a proliferation of the capsular epithelial cells, a single layer of hexagonal cells lining the inner surface of the anterior capsule being said to have the office of producing the lens fibres, also of promoting proper osmosis between the lens substance and the lymph in the anterior chamber. If, therefore, any change takes place whereby the anterior capsule no longer acts as an osmotic medium, the nutrition of the lens must necessarily suffer, and a loss of its normal transparence occur. The percentage of recoveries from operations is said to be equally as good as in healthy individuals. The vitreous is said to be but secondarily affected. It is cloudy at times, but this is due to affections of the retina or choroid, most frequently hæmorrhage.

The ophthalmoscope does not always reveal changes in diabetic amblyopia. Changes are, however, found in the retina and optic nerve incident to the disease. The appearances of retinitis are much like those seen in albuminuric retinitis; sometimes there is a cloudiness of the retina with hæmorrhage, but the white specks seen in albuminuric retinitis do not always appear. Such derangements, though usually late, may occur at any period. There is nothing in the visual symptoms which peculiarly characterizes diabetes. The ophthalmoscopic examination may be negative, but the symptoms, central scotoma, and peripheral contraction of the visual field are significant of the disturbance of the optic nerve.

T. Davis Pryce⁶_{July 14} describes two cases of peculiar *erythema* and *œdematous condition* of the feet, which he calls erythematous œdema. He considers it due to peripheral nervous disturbances, probably a neuritis resulting from the circulation in the blood of the diabetic poison; and this neuritis is specially located in the sensory, vasomotor, and trophic nerves, as evidenced by pain, congestion, œdema, and commencing tissue destruction.

Teschemacher⁵⁷_{Sept. 30} reports three cases of glycosuria in which during the presence of *vesical catarrh* the glycosuria disappeared,

reappearing with improvement in the vesical condition. One was a man of forty years, another a woman of fifty-eight, who had been three years under his observation, and the third a boy eleven years old. It would seem that under certain rare and unknown conditions vesical catarrh furnishes a ferment which causes complete destruction of the sugar in the urine while in the bladder. That this is true is shown by the fact that not unfrequently there are met cases of diabetes with vesical catarrh where no such effect is produced. These cases are, of course, to be carefully distinguished under another category, constituting intermittent glycosuria, where the sugar remains out of the urine for weeks, till some emotional cause or great error of diet causes its return.

DIABETIC COMA.

O. Minkowski ⁶⁹_{Nov. 1} reiterates his belief that diabetic coma is due to the presence of oxybutyric acid circulating in the blood, thus diminishing its normal alkalinity, and claims that it presents a complete analogy to acid poisoning of the blood experimentally produced. In experimental acid poisoning the timely addition of alkali to the blood produced improvement in the symptoms. But up to the present time all treatment of real diabetic coma based upon this view has failed of its purpose. Out of four cases collected by him, in which considerable quantities of alkali (thirty to one hundred and twenty grammes of sodium bicarbonate) were administered, in not a single instance was it possible to secure an alkaline reaction of the urine. This shows at least that a very great excess of acid was present in the organism of the patient, and that the quantity of alkali introduced was still insufficient to restore normal alkalescence to the blood. In a case where one hundred and twenty grammes of sodium carbonate were introduced the blood at the autopsy was decidedly acid. The failure of the alkaline treatment can scarcely be explained on the ground of the irreparability of the diminished alkalescence, since it is not easy to understand why it should be difficult to overcome this by the addition of a sufficient quantity of alkali. He thinks the failure may be explained by the fact that the continued acid produces rather a gradual derangement in the organism, and especially of the nervous system, which leads to fatal and irrecoverable coma. From this point of view it is plain that the prophylactic alkaline treatment suggested by

Stadelmann is to be recommended, although experience must still teach us whether it is to be confirmed. It is at least possible that the timely use of alkali at the beginning of coma may hinder the irreparable lesions which lie at the bottom of diabetic coma.

William Squire²_{July 21, 88} denies that oxybutyric acid is the cause of diabetic coma or that acetone is itself a poison, and instances, as others have done, cases of acetonæmia without coma or diabetes, also cases of diabetic coma in which there was acetone, but not in the blood. He quotes the experiments of Ferriehs, showing that half an ounce given daily for some days is harmless.

Cases are constantly occurring which go to prove the correctness of the statement, long ago made by Prout, that nervous excitement and fatigue are frequently the exciting causes of diabetic coma. Thus, J. Dixon Mann²_{Apr. 27} reported to the Pathological Society of Manchester a case in which this condition was excited by the shock of a strangulated hernia. Fredk. W. Mott¹⁵_{June} in a report of four cases, refers to fatigue, nervous excitement and depression of spirits by admission to hospital as causes; also to sudden change in diet or the omission of drugs having a powerful influence on the disease, as being placed upon a purely diabetic diet after having been upon a mixed one. It has occurred to me to lose a patient from this cause a few hours after a journey of several hundred miles.

Francis Minot⁹⁹_{June 10} reports two cases of diabetic coma in which diabetes was unsuspected. One was that of a young woman twenty years old, married, and being, as it was supposed, in her usual health. She was taken with vomiting on the afternoon of January 31, 1887, after eating a hearty dinner. She became gradually unconscious, remaining so until she died on the morning of February 3d. Being called to her in consultation, Dr. Minot recognized her as a case he had previously seen and in whom he had recognized the disease. She was four and a half months pregnant at the time, and seemed to have died of convulsions.

The second case was that of a lad of fifteen years, who also was supposed to be in good health, but had been losing flesh. He, too, began to complain after eating a good dinner, becoming somnolent, and soon unconscious. His breath had a sweetish odor, and plantar reflex was present. Investigation showed that he, too, had had the usual symptoms of diabetes for some time, but the disease was not recognized.

COMPLICATIONS.

Albuminuria in Diabetes.—Pollatschek^{No. 12, 114} has collected the results of the examinations by Lippman of cases of diabetes with albuminuria at Carlsbad during 1885 and 1886. There were found minimal traces of sugar in one hundred and eighty-two specimens; a strong sugar reaction in one hundred and forty-one; a quantity from 0.2 to $\frac{1}{2}$ per cent. in one hundred and forty-seven; a quantity of $\frac{1}{2}$ to 1 per cent. in one hundred and seventy-three; 1 to 2 per cent. in one thousand five hundred and thirty-four; 2 to 3 per cent. in eighty-nine; 3 to 4 per cent. in ninety; 4 to 5 per cent. in fifty-nine; 5 per cent. and over, fifty-two. Total specimens, one thousand one hundred and eighty-seven. Of these the first group contained albumen fifty-three times, equaling 21.9 per cent.; the second group, forty-eight times, 34 per cent.; the third, eighty-two times, 33.2 per cent.; the fourth group, seventy-two times, 41.6 per cent.; the fifth group, sixty-one times, 39.6 per cent.; sixth, thirty-nine times, 43.8 per cent.; seventh, thirty-eight times, 42.2 per cent.; eighth, forty-two times, 40.6 per cent.; ninth, twenty times, 38.4 per cent.. Total, four hundred and thirty-seven times, 36.7 per cent.

The frequency of the occurrence of albuminuria in diabetics equalled, therefore, an average of 37 per cent., but a fixed relation between the intensity of the sugar and albumen excretion could not be shown, as there were traces of albumen in large glycosurias and large quantities of albumen with small percentages of sugar. Equally little could be shown a progressive increase in the treatment of albuminuria corresponding to the higher degrees of sugar excretion, although in general the urines which presented over 5 per cent. of sugar appeared to contain albumen more frequently than those with smaller quantities.

Phlegmonous and Gangrenous Processes in Diabetes Mellitus.—From the study of a number of cases, Max Schüller^{No. 4} concludes that this process, instead of being the result of the specific action of sugar upon the tissues, as suggested by the older authors, as Marchal (de Calvi) and even Roser, they are, as König first suggested, caused by infection, just as the other phlegmons. It is not even probable that they are due to any other special micro-organisms peculiar to diabetes. Schüller at least had found no other than the round diplococci and streptococci found in the usual

phlegmonous suppurations. Nor were they conspicuous by their large numbers, but rather by the stubbornness with which they resisted antiseptics, although they finally yielded to it. It may be supposed, too, that in consequence of the nutritional derangements in diabetes the resistance of the tissues to their operation is less.

Marchal (de Calvi) thought that the presence of sugar in the blood caused an inflammatory diathesis. O. Weber and Cantani suggested that in diabetes the tissues contained less water, and as a consequence of this they showed a greater disposition to gangrene, just as gangrene is caused by the action of alkalies which take water from the tissues. But Schüller thinks that this is doubtful. Weber holds, also, that without some external cause carbuncle and furuncle would be as rare in the diabetic as in the healthy individual. Senator¹⁴¹ says that sometimes gangrene in diabetes is similar in its course to senile gangrene and is due to the destruction, inflammation, and degeneration of arteries; but although in some cases obliteration of the involved artery is found, in others none of the embolic and atheromatous processes which as a rule cause gangrene in the old are found. In opposition to this Schüller says that, at least in one of his cases of gangrene of the foot, a high degree of arterial sclerosis and previous inflammation co-operated. The extensive calcification of the middle coat of the artery produces considerable alteration of the lumen, and stiffening of the wall of the artery must necessarily produce considerable slowing of the arterial blood-stream, and, although the development of the muscular coat of the vein was able for a time to counteract this, the sudden inflammation caused by a corn ultimately brought the circulation completely to an end. The suppuration apparently produced by micrococci operates not only through swelling of the tissue compressing the walls of the small vessels, but probably also chemically altering them, favoring coagulation and the slow movement of blood. Upon this may act favorably the nutritional derangements of the tissues. Whether the larger vessels also favor the distribution of the micrococci has not been determined, although this may be possible.

Gangrene.—The most exhaustive and valuable paper which has appeared upon diabetic gangrene for many years was read by William Hunt⁹ before the Philadelphia County Medical Society, November 28th. After reviewing the literature, which is

very sparse, as to associated gangrene and diabetes, he analyzed thirty-two sets of answers to a series of three questions which he had distributed, namely: 1. How many cases of diabetic gangrene have come under your notice? 2. What is the social standing of the patients—wealthy, medium, poor, hospital or private, their ages and sex? 3. How many of all your diabetics have consumption?

Of the thirty-two answering, including himself, seven had seen no gangrene and twenty-five reported sixty-four cases. He was particular to eliminate double reporting, and that the cases should be known by actual examination and record to be diabetic, and he excluded ordinary carbuncles and boils.

The ages, where given, were: one between thirty and forty; two between forty and fifty; eleven, fifty and sixty; twelve, sixty and seventy; ten, seventy and eighty; two, eighty and ninety. One exceptional case of Morton's, a diabetic aged nineteen, in whom gangrenous sloughing took place after a needle operation for cataract, is reported. One of S. Solis Cohen's cases was a young female. Of the sexes given, twenty-four were females and twenty-five males. Of social standing, where given, sixteen were wealthy, twenty-three medium, nine poor, and of these six were in hospital. Dr. Brush reported a most interesting case of a female diabetic aged forty, a lunatic. She had large ecchymoses on her limbs, which became gangrenous; she died. The autopsy revealed a gumma the size of a large pea in the floor of the fourth ventricle. The seats of gangrene were reported as: Lower extremities—below the knee, thirty-seven; thigh and buttock, two; nucha (not ordinary carbuncle), two; external genitals in female, one; lungs, three; fingers, three; back, one; eyes, one.

Hunt sums up some interesting points with regard to his own cases: "I have nine cases to speak of, five of which were gangrenous and three rapidly advancing toward it when death overtook them. One was peculiar and unverified. All are dead. One was in medium circumstances, all the others decidedly wealthy. The ages ranged from fifty to ninety-three, four of them being above seventy; five were women, four men. In none of them was the classical emaciation present at any time. The disease was intermittent in two. The urine in one of these cases would range as low as 1010 specific gravity, with slight traces of sugar, and then

advance to 1030 and 1035, with evidence of abundance of it. Another case also ranged from low to high at varying times, but not so marked as the first." The seats of the gangrene in five of his cases were: foot and leg below knee, three; thigh and buttock, one; nucha (not ordinary carbuncle), one.

"Gangrenes, as a rule, are generally of the soft or humid kind. This, however, depends much upon the part involved. Where the tissues are succulent, the gangrene will also be of that character; where they are composed mostly of skin, tendon, and bone, they will approach the senile gangrenes in appearance. The remark made by Holmes Coote is also applicable. He, speaking of the terms used in the descriptions of gangrene in general, as dry, moist, etc., says: 'When death of a part takes place rapidly, the vessels still contain blood and the usual fluids, and the mortified parts are moist and soft. When, on the other hand, the death is slower, there is usually a deficiency of the supply of blood, the vessels become empty, and the part hardens and withers.' There is this distinctive difference between the diabetic and the senile gangrenes, according to my observation: The former rarely or never present the clear-cut line of demarcation between the dead and living parts that is characteristic of the latter. This fact, with a want of the decided dryness and shriveling of the senile variety, should suggest the diabetic form, but in any case the urine should be examined."

Dr. Hunt says, further, that he should not be surprised to find, after thorough investigation, that in numbers diabetic gangrenes should be found to hold the second place in civil practice, traumatic gangrenes, including those from frost-bite, burns, and scalds, only exceeding them.

In the discussion which followed the reading of the paper, Thomas G. Morton said that thirteen cases of diabetic gangrene had come under his observation, generally in consultation. In all instances the disease involved some part of the lower extremity, generally originating in one or more of the toes or about the dorsum of the foot. Many years ago he witnessed a needle operation for cataract in a young girl who was known to be markedly diabetic; sloughing and gangrene of the orbital contents resulted, and death by coma occurred on the third day. With some few exceptions, the patients he has seen with gangrene in the course

of diabetes have been in good circumstances. He referred to this because it has been suggested that this disease more frequently occurs among those who are surrounded by the comforts and luxuries of life and not among the poor. Gangrene in diabetes, in the cases he has seen, has generally started in a local inflammation, resulting from some very trivial cause ; on several occasions he has known it to follow the operation of cutting a corn. The occurrence of gangrene in diabetes seems to be a certain indication of great nervous exhaustion and of a general condition most critical. Although he has observed gangrene as a result of diabetic condition in parts of the body other than the extremities, notably in diabetic carbuncular disease, yet gangrene appears more often in the toes and feet, where there is but a moderate amount of cellular tissue, and where the circulation in such cases is apt to be feeble.

John Ashhurst, Jr., had but one recorded instance of diabetic gangrene in his personal experience. The patient was a man of middle age, sent to the hospital with strangulated hernia of some four or five days' duration. The attending physician stated that the man had long been a diabetic. Operation was deemed imperative and was undertaken. There was but a small patch of gangrene in the bowel, which was left in the wound after relieving the constriction, so as to allow the formation of an artificial anus. Next day not only the bowel but the edges of the wound and the surrounding tissues were gangrenous, and death rapidly ensued. It was a case, then, of rapid, moist gangrene, following a comparatively small incision.

Dr. Ashhurst saw indication of great nervous exhaustion, and of a general condition most critical. Although he has observed gangrene as a result of diabetic condition in parts of the body other than the extremities, notably in diabetic carbuncular disease, yet gangrene appears more often in the toes and feet, where there is but a moderate amount of cellular tissue, and where the circulation in such cases is apt to be feeble.

James Tyson said that, notwithstanding the exhibit made in the exhaustive paper of Dr. Hunt, he could not but think that diabetic gangrene is a rare disease. Taking his own experience, of fifty-five recorded cases of diabetes in private practice since 1884, and probably at least twenty-five more prior to that date not so accurately recorded, and realizing, as he always had, its possible occur-

rence, the fact that not a single case has occurred under his observation is a significant one. It is to be remembered, of course, that many of these cases passed from his notice before they terminated.

James Darrach had seen but one case of gangrene associated with diabetes.

William Osler said that in his own experience in six autopsies of diabetes mellitus, there was one of gangrene.

Dr. Nancrede added another case to the list; it was one of moist gangrene with large amounts of sugar in the urine, where the disease started in the fourth toe. In the other case he amputated the thigh high up for moist gangrene *not* due to diabetes. It illustrated the futility of amputating anywhere near the site of disease, for the artery was thrombosed to the groin. Unless the operation be done above the knee for gangrene of the foot, we are almost certain to have recurrence in the wound, with rapid spread of the disease and death.

Schuster,⁶⁹_{Nov.1} alluding first to the frequent reference in the daily press of persons dying in consequence of a prick with a steel pen after the cutting of corns, reports two cases of gangrene of the foot in diabetes, the first succeeding injury caused by stepping upon a nail. Early amputation saved the patient's life. The second case succeeded the cutting of the corn, terminated fatally, apparently in consequence of a too long delay in operation.

Turner,²_{May 10} exhibited to the Pathological Society of London the left gangrenous kidney of an obese female aged sixty, dying of gangrene of her right foot and leg, and who had glycosuria. The papillæ, with a great part of the pyramids of the kidney, were necrotic and partly detached from the living tissue, which appeared unchanged up to the line of separation. The organ appeared otherwise healthy. The other kidney and bladder were normal. There was fatty infiltration of the heart of atheromatous origin, but no valvular lesion. Two similar specimens which had been presented to the Society were referred to. This simultaneous occurrence of gangrene was attributed to thrombotic obstruction of the arterioles, due to defective general nutrition. The separation of the pyramids, instead of their absorption, as in the case of cortical necrosis, was attributed to the contact of the necrosed tissue with the urinary secretion.

Erysipelus.—T. M. Rotch,⁹⁹_{Jan. 10} reported to the Boston Society

for Medical Improvement the case of a lady of forty-one who came under his care with diabetes. Eight days later she acquired erysipelas of the face and nose, which extended not only over the entire head, but down the body to the waist. Six days later she passed into a condition of stupor and died four or five hours afterward. At the same discussion on Dr. Minot's case, F. W. Goss also reported a case complicated with erysipelas, terminating fatally.

Diabetic Phthisis.—The subject of diabetic phthisis, like phthisis occurring under other circumstances, has been much unsettled by the new views on the etiology of phthisis. Charles Eloy,⁸⁵ of the French school, says the term is to be condemned from the triple point of view of pathological anatomy, clinical observation, and therapeutics, and declares in favor of the histological identity between the pulmonary tuberculosis of diabetes and the classic pulmonary tuberculosis. There is an identity, too, from the microbic point of view, Leyden, Rutmeyer and others having demonstrated the presence of the pathogenic bacillus in the expectoration, the pus of the cavities, and in the pulmonary embolism of the diabetic. It is true that there is a certain peculiarity in the symptomatology, which, however, does not invalidate the view taken of its pathological anatomy and bacteriological origin. Thus it is generally admitted that its approach is insidious, the cough is dry, the expectoration comparatively scanty, hæmoptysis rare, while the temperature never exceeds 38° C. (100.4 F.). There is sugar in the expectoration. Sometimes, though rarely, on the other hand, the initial symptoms are those of a frank pneumonia or bronchopneumonia. Again, the invasion of tuberculosis often modifies the course of the diabetes. The polyuria is diminished, the glycosuria disappears, albuminuria often replacing it. It is true the bacillus tuberculosis is not always found in the sputum, but in this respect it does not differ from tuberculosis implanted in the healthy organism.

Relation of Diabetes to Heart-Disease.—Jacques Mayer, of Carlsbad,¹¹⁴ says that disease of the circulatory apparatus, and especially of the heart, occupies but a small place in the literature of diabetes, because pathologists have given less attention to these organs after their search for the pathological anatomy of the disease than they should. He summarizes the work of others in this

direction, and bases his own paper on the study of thirty-three cases, two hundred and sixty-six males and one hundred and fourteen females, 65.26 per cent. being between the ages of forty and sixty. Of the three hundred and eighty cases, three hundred and thirty-seven were in the first stage of diabetes and forty-seven in the second stage; of the latter twenty-six were under observation during both stages. He reports increased cardiac volume, either from hypertrophy or dilatation, as much more frequent in diabetes than one would suppose from the literature, it being found without other anatomical lesions in eighty-two of the three hundred and eighty cases. He ascribes this enlargement to the irritation by sugars and urea in the pathological blood.

O. Israel noted at the Berlin Charité that of the patients who died of diabetes, 10 per cent. had cardiac enlargements without valvular or arterial lesions or renal disease. Mayer has also found that in Virchow's necropsy reports the heart was enlarged in nine cases out of sixty-nine, and exclusive of those in which there was enlargement from anatomical causes (vascular, valvular, or renal disease), a percentage of 13 against Mayer's 21.6. The cardiac lesions in diabetes, in addition to hypertrophy and dilatation, are fatty metamorphosis, fatty infiltration, brown atrophy. In sixty-six cases from the Berlin Pathological Institute, Mayer found thirty of renal disease. In his own three hundred and eighty he found it in sixty-four.

Syphilis and Diabetes.—In a summary of observations of this relation, Augagneur³⁰⁴ says that first the primary syphilitic affection is influenced by diabetes. Arnaud, Cusco, Labbé, Hamonic, de Tournery, and Augagneur himself, have met especially severe forms of gangrene and phagedænic ulcers in hard chancre in cases of diabetes. A patient of Labbé's had a diabetic ulcerated surface of such a character that he had made a diagnosis of carcinoma and later of gummy tumor of the penis. Great extension and deposit of gangrenous phagedæna are also found in the hard chancre of diabetes, with indisposition to cicatrization, which may occur with deep-seated scars producing deformity and hindered erection. The galvano-cautery and actual cautery were used to secure cicatrization. More limited is our knowledge of syphilis of the diabetic in the second stage of the former. In a case of Augagneur the secondary symptoms occurred at the usual time, and, when the

irregular life of the patient is remembered, were rendered milder. Three years after the beginning of the syphilis the patient died of gangrenous phlegmon of the arm.

Gangrenous chancres usually occur in parts easily irritated by the urine, where balanitis and phimosis are present, and in the case of women pruritus and eczema of the vulva are seen. The saccharine urine with the yeast fungus developed in it is the cause of erosion of the mucous membranes, which are further irritated. The contact with the urine is sufficient to impress upon the specific lesions an inflammatory, gangrenous, and ulcerated character. In other cases uncleanliness and the absence of hygienic habits are the cause. Spontaneous and traumatic gangrene are also favored by the fact that the perspiratory glands also eliminate the sugar; and where the latter perform their functions badly and the skin becomes saturated with sugar, diabetes and gangrene occur. The skin is also irritated by the sugar passing out upon it, as happens to those working in sugar, who thus acquire eczema and ecthyma.

Finally comes the question, is syphilis ever the cause of diabetes? Temporary glycosuria has been associated with various skin lesions and with the absorption of putrid products. The same may be true of those of syphilis. Further, syphilitic new formations may press upon the floor of the fourth ventricle and produce glycosuria. In most cases there is probably cerebral syphilis. Dub reports a case of a twenty-year-old syphilitico-diabetic who had facial paralysis; Seegen, a forty-five-year-old with persistent cephalalgia, exostosis of the tibia, and ecthyma. Syphilis influences diabetes only through its local effects.

PROGNOSIS.

Schnée¹¹⁴² furnishes more than usually favorable statistics as to the prognosis in diabetes mellitus. Thus, out of seventy-one cases from 1881 to 1884, fifty-three are reported radically cured, ten improved, and eight died. No statement is made as to the fact whether the cases of recovery were traumatic cases or true diabetes.

Preynier⁴¹⁹_{v.12,p.444} calls attention to the presence or absence of the tendon reflex in diabetes upon operations as the result of eight observations, and comes to the conclusion that in diabetics in whom the tendon reflex is retained surgical affections take a

normal or slightly abnormal course, while in those in whom it is deficient the progress is more unfavorable.

TREATMENT.

The fundamental principle of treatment of diabetes remains unchanged: A diet as far as possible free of carbohydrates, life in the open air, avoidance of overexertion and excitement, bodily exertion in accordance with the strength, care of the skin, bathing and observance of the best hygienic rules.

Spontaneous Cessation of Glycosuria.—Teschemacher, of Neuenahr, ⁸⁴_{Mar. 10} reports such a case in a woman of sixty, in whose urine repeated analysis showed 6 per cent., thirst and other symptoms being also present. She was, however, well nourished and not particularly feeble, and bore a long railroad journey to Neuenahr. On the next day after her arrival the sugar disappeared. Coignard ¹⁷_{Jan. 6} makes the same statement with reference to patients arriving at Vichy.

Dietetic Treatment—Diabetic Foods.—A critical examination of so-called diabetic foods continues to show their unsatisfactory character as substitutes for wheaten bread. Chas. Harrington, ⁹⁹_{Mar. 23} before the Boston Society for Medical Improvement, reports the results of analysis of a number of these foods, greatly vaunted by their makers. For convenience in presenting the subject we have changed somewhat the order taken by Dr. Harrington, and placed at the head of the analysis the home-made bread,—wheaten, it is supposed,—which contains of starch 44.99 per cent.=sugar, 49.35 per cent.; moisture, 37.25 per cent.; corn cake, white meal, contains, starch, 38.04 per cent.=sugar, 42.37 per cent.; moisture, 44.62 per cent. The Graham wafer made of Graham flour contains, starch, 58.45 per cent.=sugar, 64.94 per cent.; moisture, 3.94 per cent. These are the home-made articles used usually proscribed from diabetic diet. The gluten flour of Farwell and Rhines, of Watertown, N. Y., contains of starch 67.17 per cent., which will produce of sugar 74.63 per cent.; moisture, 8.69 per cent. Bread of this flour would contain the usual amount of moisture, but over 30 per cent. of starch, equivalent to 35 per cent. of sugar. The special diabetic foods of these same makers contain of starch 68.18 per cent., which will produce of sugar 75.76 per cent.; moisture, 8.10 per cent. The bread made of this flour would contain 36 per cent. of starch, which

would be equivalent to 40 per cent. of sugar. The Health flour of the same firm contains of starch 72 per cent., which will produce 80 per cent. of sugar; moisture, 8.3 per cent. It would produce a bread containing 36 per cent. of starch, which would produce 40 per cent. of sugar. The gluten flour of the New York Health Food Company contains 66.18 per cent., yielding 73.52 per cent. of sugar, and moisture, 9.30 per cent. The bread made of this flour would contain 35 per cent. of starch, yielding about 38 per cent. of sugar. The gluten wafers, plain, of the same company, contain of starch 66.96 per cent., yielding sugar, 74.40 per cent.; moisture, 8.10 per cent. Gluten wafers made with butter are much more palatable than the plain biscuits, containing of starch 51.14 per cent., which would yield of sugar 56.82 per cent. The moisture = 7.74 per cent.

Dr. Johnson's "Educators," a biscuit strongly recommended and said by the seller to be absolutely free from starch, contained of the latter 71.42 per cent., yielding 79.31 per cent. of sugar, and the moisture = 5.44 per cent.

The Boston Health Food Company's diabetic flour No. 1, sold as absolutely non-starchy, contained 62.94 per cent. of starch, yielding of sugar 69.92 per cent.; moisture, 8.13 per cent. Bread made of it would contain of starch 30 per cent., equivalent to 33.30 per cent. of sugar. Diabetic flour No. 2 contained of starch 54.88 per cent., furnishing of sugar 68.98 per cent., moisture, 7.66 per cent. Bread made of it would contain about 23 per cent. of starch, equivalent to 25.55 per cent. of sugar. Flour of bran, sold as pure bran, devoid of starch, was found to contain a mere trace of starch, and seemed to be finely washed bran. Carlsbad wafers, supposed to be made of white of egg and glycerine, were found to contain a large amount of sugar.

E. S. Wood, in the discussion which followed the reading of the paper, referred to a specimen of diabetic flour which had been sent to him for examination, found to contain 70.50 per cent. of sugar when the starch had been converted. The manufacturers were informed of this and then sent a sample containing 39.4 per cent. Ordinary Graham flour yielded a little over 70 per cent. of sugar. Of two specimens of Paris diabetic bread, one yielded 27 and the other 37 per cent. of sugar.

While language can scarcely be found too strong to denounce

the unsubstantiated claims of the producers of the diabetic foods, I cannot but think that Dr. Harrington allows his enthusiasm to carry him too far in totally denouncing the so-called diabetic foods. His own analyses show that certain foods contain less starch than the ordinary wheaten bread, and just to this extent they are to be preferred to bread made of pure wheat flour. The experience of all who have had to do with the treatment of diabetes goes to show that while bread is one of the most harmful foods, yet it is one which the diabetic patient omits with the greatest reluctance. And although there are cases in which all breads are harmful, there are others in which a small amount of wheat bread may be permitted. To such even a larger amount of bread made of the special flour would be admissible, because such amount would contain no more starch than a smaller quantity of the pure wheaten flour. So with regard to pure bran. The mistake is made in claiming it as a valuable food. It is not a valuable food, though not wholly unnutritious, and, therefore, if it will satisfy the patient there is no reason why it should not serve a good purpose. Even Dr. Johnson's "Educators," as they are unfortunately called, and which come in for a good share of reproach, containing, as they do, by Dr. Harrington's analysis, 23 and 33 per cent. of starch, must be better for the diabetic than pure bread, and the mistake of Dr. Johnson is to claim that they are what they are not. The real difficulty is the extreme uncertainty in the position of these foods, of which certain samples, as the second analyzed by Dr. Wood, do certainly contain a smaller quantity of starch, 39.4 per cent., and it would seem the processes employed in making them are uncertain, resulting at times in more starch and at others less.

With a view to enabling the physician to settle for himself this question, Chas. A. Doremus¹⁰¹ has suggested an approximate method of determining their value, as follows: five grammes (seventy-seven grains) of bread or other article of food, a slice cut to give the average of crust and crumb, are digested in a closed flask—a patent rubber-stopper beer- or soda- bottle answers the purpose admirably—with one hundred cubic centimetres (three ounces and three drachms) of water and ten cubic centimetres (two drachms and forty-five minims) of pure, strong hydrochloric acid. The flask is kept at 100° C. (212° F.) for at least three

hours, say, in a saucepan of water brought to boiling; neutralize the liquid, after cooling it, with sodium carbonate and dilute to five hundred cubic centimetres (one pint). To test the amount of sugar, use Fehling's standard solution. Ten cubic centimetres (two drachms and forty-five minims) of this, when completely decolorized, indicate the presence of .05 gramme ($\frac{77}{100}$ grain) of sugar, and therefore of .045 gramme ($\frac{7}{100}$ grain) of starch. If the bread contain 10 per cent. of starch, then there will be .05 gramme ($\frac{77}{100}$ grain) in the five hundred cubic centimetres (one pint), and ten cubic centimetres (two drachms and forty-five minims) when filtered should decolorize 2.2 cubic centimetres (thirty-six minims) of Fehling's solution, which should be used in the usual manner, complete decolorization indicating 10 per cent. of starch or over. Several tubes containing two, four, and six cubic centimetres (thirty-three minims, one drachm, and one and one-half drachms) of the Fehling's solution may be heated simultaneously, and thus an approximate knowledge of the quantity of starch be easily arrived at.

Van Abbott's gluten biscuits are said² to contain only as much starch as is absolutely requisite to hold the gluten together, viz.: 1.6 and 1.9 per cent. The almond cakes have 3.8 per cent. of starch, with 4.1 per cent. of sugary matter. The preparations are flavored with saccharine. The writer, however, says of the saccharine that, unfortunately, its taste is so persistent as to outlast for hours that of the articles of food flavored with it, even if exceedingly small quantities are used, coinciding thus somewhat with my own experience, referred to in the next paragraph.

Charles W. Purdy⁶¹ speaks very highly of saccharine as a sweetener for diabetics, and says that from a liberal use of it in his practice he has not met with a single instance in which its palatability was suggested as in the least inferior to the purest sugar. I have used it very little, for, in the first place, I have never had any difficulty in persuading my patients to omit the use of sugar altogether; and, second, in my personal experience with saccharine I have found its sweetness far from pleasant, suggesting, as it did, the sickening sweetness of salicylate of sodium. Purdy has, however, suggested more important uses for it; he says that through its antiseptic properties it may retard the abnormal fermentative changes in the stomach so common in diabetes; and while practi-

cally we have not sufficient data to judge of its effects in large doses on the blood of patients, both chemistry and physiology would indicate its use for the purpose of favorably influencing some of the changes in the blood responsible for diabetic coma.

Pittroff's almond biscuits, made in Carlsbad, are a new article of food,² possessing few of the usual disadvantages of almond bread and almond biscuits, which are usually more or less tough and otherwise disagreeable, so that they cannot ordinarily be used as a continuous article of diet. They are very delicately and slightly flavored with saccharine and said to be agreeable.

W. T. O'Donnell,¹ recommends the following substitute for bran bread for diabetics, as giving great satisfaction to his patients: Six eggs are thoroughly beaten, a teaspoonful of baking powder or its chemical equivalent and a quarter of a teaspoonful of salt are added, and again the eggs are beaten. This mixture, poured into hot waffle-irons smeared with butter, is baked in a very hot oven. For variety, and to make these biscuits seem more like coarse bread, pulverized nuts of the kind permitted may be added. The biscuits may be eaten hot with butter and cheese, but will remain good for a long time, and O'Donnell says that no one would ever suspect that they were destitute of flour.

Gluten Flour and a New Diabetic Flour Made of It.—Waltering, of Münster,⁸ describes, with its uses, a new gluten flour made by Dr. John Hundhausen, of Hamm. It is a fine, light yellow flour, which becomes finer and whiter by another milling, and has the following composition in comparison with other flours and breads:—

	Water.	Albumen.	Carbo- hydrates.	Cellulose.	Salt.
White wheat grits of 1896	8.83 per ct.	82.60 per ct.	7.01 per ct.	.45 per cent.	.78 per cent.
White gluten meal of 1888	12.85 "	82 "	4 "		
Yellow gluten meal of 1888.		76 "	2 "		
Bread: 30 per cent. gluten, 60 per cent. wheat meal.....		28 "	34.50 "		
Gluten bread, with egg and butter		55 "	8 "		
Gluten bread, with milk, egg, and butter		46 "	4 "		
Gluten, with water and baking- powder		50 "	2.00 "		
Gluten bread, with butter, wa- ter, and yeast.....		60 "	8.50 "		
Gluten bread, with water and yeast		53.00 "	2.6 "		

He says that pure gluten-meal bread is three times as nourishing as meat, and that even with only 40 per cent. of gluten flour contains more albumen than the best flesh and poultry, and may be kept seven to ten days quite well. It is very useful for anæmic fat persons and for those with weak heart. The bread made out of gluten flour with water and yeast, or, instead of yeast, baking powder, contains 55 per cent. of albumen, 20 per cent. of fat, and 2.75 per cent. of carbohydrates. He first prepared it with eggs, butter, and milk, but more recently only with water and yeast or baking powder. Yeast bread is made as follows: Take five hundred grammes (one pint) of the gluten meal, mix five cents' worth of fresh yeast in a teaspoonful of tepid water, and mix the dough with a half litre (one pint) of tepid water. The doughy mass clings like glue to the fingers. It must be placed in suitable cup-form tins, made warm and smeared with butter. The dough is kept for one and one-half to two hours in a temperature 30° to 40° C. (86° to 104° F.), and is then baked for one and one-half to three hours in an oven well heated. In one to two hours the bread is fit to use. The use of baking powder is cheaper and more convenient. Five hundred grammes (one pint) of the gluten flour, with one and one-half tablespoonfuls of baking powder, is passed through a sieve, then stirred further with a wooden spoon in order that the granules of baking powder may be reduced in size and divided. The dough is then mixed with one fourth litre (half pint) of warm water. This is scarcely at all glutinous and can be much better worked than the yeast dough. It is immediately placed in the oven, and it is not necessary to let it rise.

The gluten bread thus obtained must have a brittle, hard, brown crust and a light, gray, porous crumb. The impression of the finger in the crumb rapidly disappears. To improve the peculiarly sour taste of the bread, sweet cream is most suitable; the addition of eggs, butter, and bicarbonate of sodium alters it very little or not at all. The addition of saccharine has an unpleasantly sweet taste. If the gluten bread is spread with butter, bacon, or lard, or the buttered bread covered with ham, meat, eggs, or sardines, it is quite agreeable. After twenty-four to forty-eight hours the bread becomes more tough. It must then be toasted, and poorly-baked bread must be toasted immediately. To do this small pieces the size of the finger are allowed to

remain in the oven until they become a Zweiback brown and are quite brittle. The toasted bread is then a great deal better. It can be eaten with butter, or reduced to a powder and used for raised cakes, puddings, fruit cakes, and so forth. For sauces and ragout the acid taste makes it less suitable. It is better for this purpose to use the dry toasted meal. The bread made out of the toasted meal is less tough and altogether better.

Henri Douliot, ²⁴_{Apr. 2} botanical preparer in the Museum of Natural History at Paris, says there may be extracted from the grain of wheat, by an improved process of milling, three parts quite different in their chemical composition, their physical and physiological properties. These three parts are the envelope, the embryo, and the albumen. The first, constituting the bran, is comparatively useless. The albumen is made up principally of albuminoid and amylaceous substances, that is to say, starch and gluten. By the improved process the embryo is separated from the bran and starch in a state of absolute purity. This substance at the time of its separation contains 11.55 per cent. of water, considerable of which is lost on drying, but it is necessary to maintain it at a temperature of one hundred degrees for a long time to secure absolute dryness. The quantity of nitrogen is 6.84 per cent., whence the albuminoid matter is computed to be about 42.75 per cent. This substance is of two kinds, the one insoluble in water, the other soluble but coagulable by heat. Among these is a substance capable of saccharifying starch. This substance is destroyed at the temperature at which the embryo is dried. Cellulose forms a very small part, about 10 per cent., and mineral matters 6 to 7. Finally, there are ternary substances to the extent of about 22 per cent., including carbohydrates, intermediate between starch and glucose; that is, dextrine and amylo-dextrine, glycogenic substances moderately abundant, but no traces of starch or sugar. The proportion of albumen is said to be double that found in the blood and most nutrient meats, which suggested to Douliot the production of a nutritive flour or meal. The embryos which ferment unchanged in the air are rendered permanent when dried at a temperature above one hundred degrees, and can then be reduced to a palpable powder, which he has called, from its origin, fromentine. Excellent biscuits are made from fromentine and white of egg, and at the suggestion of Dujardin-Beaumetz he has rendered them suit-

able for diabetics by sweetening them with saccharine, to which may be added the flavor of vanilla or lemon.

W. Stanley Armitage²_{Apr. 28} advises the use of semolina pudding as unattended in diabetics with increased glycosuria, where a very small amount of toasted bread and farinaceous food was followed by this effect.

Eichhorst⁹_{Aug. 11} adds his testimony to that of others against the use of an *absolute meat* diet and believes that it carries with it certain dangers. Saccharine is useful in the treatment of diabetes, but must not be given indiscriminately lest an unpleasant sweetish taste remain or nausea or disgust arise. He considers saccharine cocoa a useful beverage, notwithstanding it contains a considerable quantity of starch. Little is to be expected from medicinal treatment, although Eichhorst treated one patient with arsenic and another with opium, in both of whom the sugar disappeared. Of treatment at the springs the author gives Carlsbad the preference. The majority of patients return from Carlsbad with the urine free from sugar, but the cure is not permanent.

Medicinal Treatment.—The most important observations on the treatment of diabetes mellitus in the past year were made by J. Mitchell Bruce¹⁵_{July} on the comparative value of codeine and morphia. The results are based upon two classical cases of diabetes treated in the Charing Cross Hospital at the same time. The observation is very laborious and complete, and extends over a period of eight months in each instance.

The condition of the urine on admission having been carefully ascertained, the first step in the treatment was to put the patient on a strictly anti-diabetic diet without medicine, or, more correctly, with camphor-water, and to keep him on this as long as the sugar continued to fall. The diet was as follows: meat, six ounces (one hundred and eighty-six grammes); gluten bread, ten to fourteen ounces (three hundred and eleven to four hundred and thirty-five grammes); eggs, milk, two to three pints (one thousand to fifteen hundred grammes); tea or Van Abbott's cocoa, two pints (one thousand grammes); water and ice, about three pints (fifteen hundred grammes). When the amount of sugar had reached a minimum and was found to remain constant at or near this level for several days, it was considered that the patient had been brought to a state of sugar equilibrium. Then codeine in the form of the phos-

phate was first given, beginning in small doses and gradually increasing it until its effects were fully ascertained. The drug was then slowly reduced in dose and finally removed. After an interval of about a week on strict diet and camphor-water, which was sufficient to restore the patient to a condition of sugar equilibrium, morphine, in the form of the acetate, was commenced, and the dose, at first small, steadily pushed, as with the codeine, as long as obvious effects could be observed on the excretion of sugar.

On account of the laborious and exacting character of the investigation, involving three hundred and seventy-five quantitative examinations of sugar and three hundred and four quantitative estimations of urea, not to mention a careful record of the volume and specific gravity of the urine passed, the quantity of liquids and solids ingested, the number of stools and other necessary details, occasional interruptions of one or two days were unavoidable. In both cases pyrogalllic acid was given for a short time before the codeine for the purpose of ascertaining whether any results could be obtained from the use of safe doses of a substance proved by Noel Paton to have a powerful influence on the excretion of urea. No definite effect of the pyrogalllic acid was observed on the glycosuria in these two cases, and it was not pushed. Codeine was given to both patients in the form of phosphate, as being the salt most suitable for administration hypodermically had the investigation extended then or at some future date to an observation of the effect of this drug under the skin.

The phosphate of codeine made a decided impression on the urine, diminishing the volume, lowering the specific gravity, and reducing the amount of sugar. The maximum result was obtained about the fiftieth day, when no less than twenty-seven grains (1.75 grammes) were being taken per diem by the man and twenty-two grains (1.43 grammes) by the boy. The sugar was never completely absent from the urine of the man, the minimum excretion being six hundred and twenty grains (40.8 grammes) per diem. In the case of the boy, the sugar disappeared for one day only, rising on the next to three hundred and forty grains (twenty-two grammes.) Therewith the body-weight of the man had risen from eight stone ten pounds to nine stone two pounds in the course of seven weeks, while his physical vigor increased at the same time. The activity of the nervous system was but slightly impaired. There was only

occasional diurnal sleep, but the boy complained frequently of headache. The appetite continued good, the thirst moderate. But, in spite of the very large doses given, the codeine had not afforded complete control of the glycosuria and there was occasionally considerable increase of the secretion. Thus, on March 18, 1877, when twenty-eight grains (1.8 grammes) were given, nine hundred and thirty grains (sixty grammes) of sugar were passed. It is possible that if the dose had been pushed still higher, say to forty-five grains (three grammes) as given by Cavafy, the glycosuria might have been entirely arrested. The cost of the drug and expense and labor of the investigation did not permit further observation. With a gradual reduction of the dose of codeine, the sugar gradually rose in amount, a further proof of the influence of the drug.

The effect of acetate of morphine was even more striking than that of codeine, certainly more rapid and more powerful. The sugar fell steadily in amount and finally disappeared completely when 5.8 and 6.3 grains (0.37 and 0.40 gramme) respectively of the salt were given at a time. The volume declined from seventeen hundred cubic centimetres (three and a half pints) to one thousand cubic centimetres (two pints) in the boy; from twenty-four hundred and fifty (five pints) to eighteen hundred cubic centimetres (three pints and twelve ounces) in the man. The specific gravity was lowered from 1046 to 1020 in the boy and from 1034 to 1012 in the man. The patients' condition otherwise improved. The boy gained four and one-half pounds in weight, the man seven. Most important of all, the patients were never found sleepy or heavy or dull during the day, but, on the contrary, bright, cheerful, and vigorous. Indeed, it appeared as if the older patient suffered from insomnia, for he complained that he did not sleep more than three or four hours during the night. The pupils were slightly contracted in both cases, the boy continuing to suffer from headache.

The comparative values of the treatment by morphine and codeine in these cases were estimated through three tests: (1) the test of power; (2) of cost; (3) of safety. The first of the two drugs proved to be unquestionably the more powerful. It removed the sugar from the urine in both cases, which codeine did not, and when the excretion was greatly reduced morphine obviously con-

trolled it more completely than codeine, under which occasional increases were noted. The amount of morphine required to produce the maximum amount of benefit was but one-fourth that of codeine. The best effect was obtained by six grains (0.39 gramme) of acetate of morphine per diem; from phosphate of codeine, not until about thirty grains (two grammes), equal to twenty-one grains (1.36 grammes) of codeine, were given per diem. This is what might have been anticipated from our knowledge of the doses of the two alkaloids; but it is a very important fact, nevertheless, from the point of view of expense. Codeine costs eighteen shillings per ounce, acetate of morphia five shillings and nine pence per ounce. A patient consuming six grains (0.39 gramme) of acetate of morphine per diem could, therefore, be treated at one-twelfth the cost of a patient taking twenty-one grains (1.36 grammes) of codeine. Finally, there remains the question as to whether the drawbacks connected with the exhibition of very large doses of morphine in diabetes are not greater than those which are observed in codeine. Pavy⁴²⁸₁₈₇₈ appears to have the opinion that they are, as a result of hospital experience, which must be regarded as the source whence most recent writers on the treatment of diabetes by codeine have drawn either their information or the suggestions for their personal observations. Pavy says: "The great advantage of codeine over opium and morphia is that it is equally efficacious in controlling the disease and does not exercise the same narcotic effect." In Bruce's experience, in the cases of diabetes treated by codeine, morphine, or opium, narcotic symptoms rarely presented themselves as long as the sugar continued to fall and the drug was given every three or four hours by the mouth. He found very decided evidence of the cerebral action of morphine in diabetes in the hypodermic method.

Valuable as opium, morphine, and codeine are in the treatment of diabetes, the large size of the dose restricts their general employment. On examining the charts it will be found that while both codeine and morphine had to be given for a long time and in large doses before the sugar reached a minimum, the difficulty chiefly consisted in removing the last traces. In the first case it required twice as much morphine per diem to remove the sugar from the urine as it required to reduce it to one hundred and sixty-seven grains per diem, a comparatively safe excretion. He would

suggest that in routine practice we should be satisfied with this degree of success, secured by an administration of the amount of the drug to which no one could reasonably take exception.

Finally, Dr. Bruce would once more indicate that these results refer to the action of certain drugs plus rigid dieting. Only in this way, by first establishing a sugar equilibrium by proper feeding, could the real action of the drugs be ascertained. How far morphine and codeine can influence diabetes in ordinary diet is another question.

Further evidence in favor of morphine and codeine, one or both, continues to be furnished. Thus Bartholemy Novaro⁴¹_{Oct. 4} reports the effects of its use in a number of cases with the following results: Cured, seven; improved, two; without results, one; died, two—the last being cases of extreme severity. The method pursued was as follows: One gramme (fifteen grains) of codeine was divided into twenty pills, of which on the first day three were taken. If this was not followed by an untoward effect, such as headache and sleepiness, on the following day one more pill was added, and, with continued tolerance on the third day, another, so that the patient very rapidly reached a daily dose of 0.25 of a gramme (3.9 grains). The increase was soon followed by an effect upon the quantity of urine and its sugar capacity, generally favorable, but in some cases absolutely *nil*. If the effect is very rapid the cure is not apt to be permanent, and the drug is continued two or three weeks. Codeine may be combined with other treatment, as mineral waters, baths, massage, gymnastics, meat diet, etc. As to the mode of operation, Novaro thinks it is likely to diminish the sugar production by calming the glycogenic power through the nervous system. Although codeine does not cure all diabetics, it cures many, and almost all are improved.

With regard to the *milk treatment* of diabetes, Arnold Pollatsh¹⁵⁰_{June} says that in certain cases milk-sugar is completely assimilated, and in such cases an abundance of milk may be permitted. As carrying out the idea that active muscular exercise, first recommended by Zimmer and later by Finkler, is of advantage, Pollatsh recommends massage, and refers to a peculiar apparatus recently constructed by Gaertner for this purpose. He regards, however, such apparatus and even the ordinary method of practicing massage as unnecessary, and recommends the patient to

practice self-massage, by which he secures the effects of both the active and passive motion.

The following is a summary⁵⁰ of treatment recommended by Hoffmeister, of Carlsbad: 1. The hygienic treatment should not be totally changed in a sudden way. Sweet things must be at once forbidden. Amylaceous food should at first be confined to vegetables of all kinds, except the leguminous ones, and bread, one hundred grammes (two ounces and three drachms) of which may be allowed, this quantity being gradually reduced to sixty grammes (two ounces), and so on. 2. Pure fat and fatty meats are highly recommended for their great efficacy against congenital predisposition to diabetes. One hundred to one hundred and fifty grammes (three ounces and two drachms to four ounces and six drachms) may be allowed daily. 3. An exclusive meat diet is rather dangerous in diabetes, because it strongly promotes the destruction of albumen, that is to say, emaciation. 4. All substitutes for bread are objectionable, partly because they contain a considerable amount of starch and partly because they are all more or less indigestible. Fürbringer's gluten bread, manufactured by Basermann, of Manheim, seems to be the least injurious of these. 5. Diabetics should masticate thoroughly each bit of food, eating slowly in order to mix the food with the mucus of the mouth. 6. In all cases in which a somewhat large indulgence is admissible, all sorts of vegetables, including the sweet ones (turnips, carrots, cabbage, etc.), only excluding the leguminous, are permitted, likewise raw kernel-fruits and berries. 7. Milk and wine should be allowed only in small quantities, even in mild cases; half a pint of each daily should be looked upon as a maximum dose. All sorts of beer must be forbidden under all circumstances. 8. Exercise is much indicated, especially while farinaceous food is partly allowed. The best time for it is immediately after dinner, and it should be continued for at least two hours. Riding on horseback and hill climbing, if the ascent is not too steep, are certainly preferable to gymnastic movements indoors; but when outdoor exercises cannot be taken, a good substitute is the ergostat, recently invented by Professor Gaertner, of Vienna. Patients who in any stage of the disease are easily fatigued by the least muscular exertion will derive great benefit by massage of the whole body for twenty minutes each day. 9. Warm baths, as the

best means of keeping the functions of the skin in order, are very beneficial, provided they are used at a temperature of ninety-three or ninety-four for twenty minutes, not oftener than twice a week. 10. The mineral waters of Carlsbad are undoubtedly of the greatest use in the dietetic and medicinal treatment of diabetes. 11. Among the innumerable drugs recommended there are a few worth mentioning. In the first place, there is opium, the tolerance of which by diabetic patients is very remarkable and inexplicable. Opium makes the sugar disappear. It diminishes the abnormal tissue waste and consequently increases the weight of the body. It causes neither narcosis nor constipation in doses which would be positively dangerous if given in other diseases. Still more efficacious is morphine, in doses of one to three grains (0.065 to 0.19 gramme) daily. The beneficial effects of these drugs, however, do not last long; after three or four months they lose their effect, and there is, moreover, the risk of the opium habit being incurred. They should therefore be taken only at long intervals and under strict medical supervision. Salicylic acid, phenol, and salicylate of sodium are far less useful.

The views of European writers seem to be as much at variance on the subject of the use of milk in diabetes as upon this side of the Atlantic. Thus, according to Stokvis, ¹⁰⁰⁸/₁₈₈₆ milk, including buttermilk, whey, and koumiss, are to be avoided in bad cases of diabetes. Hoffmann, on the other hand, recommends the use of milk for cases in which demonstrable alterations of liver or kidney are present, and after the disappearance of the sugar the patient is returned gradually to a mixed diet. In his paper on the relation of diabetes to heart-disease, Mayer ¹¹⁴/_{1884, 1885} says that both the heart and kidneys must be spared by a suitable diet. Nitrogenous food must be limited, and he has of late years used milk to a large extent and can confirm the favorable opinion of Hoffmann on this subject.

Coignard, ¹⁷/_{Jan. 5} in a communication to the Society of Medicine of Paris, gives the palm in treatment of diabetes to exercise and fresh air, nitrogenous food, and the alkaline waters, especially those of Vichy. He quotes in support of his views, especially the results of his colleague, Durand-Fardel, and of himself. The former tabulated seventy-one cases treated at Vichy, all of which had been using, more or less faithfully Vichy water while at home.

In fourteen of these cases the sugar disappeared totally under the use of Vichy at the "Springs," together with exercise in the open air, the dietetic treatment being there badly carried out. In twenty-five cases, at the end of treatment the quantity of sugar was scarcely one-fourth of what it was when treatment began; in five it was a little more than fourteen; in seven it was one-third; in eight it was one-half; in eight it did not reach one-half; finally the proportion of sugar remained the same in two cases, or increased slightly. Coignard had also seen the sugar disappear suddenly when in the proportion of twenty-four grammes (six drachms) in the twenty-four hours' urine, in a patient who for seven years had had his urine analyzed regularly every three months. For eighteen months there had not been a trace of sugar. He had met a patient who, having had glycosuria for six years, had not had any for two, and continued in good health. On the other hand, he had a patient under treatment five years who continued to have one hundred to one hundred and fifty grammes (three ounces and one drachm to four ounces and six drachms) per litre of urine. He had been a diabetic for twenty-six years, and only been coming to Vichy for the last five years. At the first visit the sugar was reduced to twenty-three grammes (three ounces), and there were no other symptoms, so that if he had not been aware that he had glycosuria he would have regarded himself as well. Coignard himself had collected in four hundred cases the results of analysis at the beginning and results of treatment at Vichy, employing for analysis polarimetry and Fehling's solution. In forty cases, at their departure there was no sugar in the urine; in three hundred and two there was diminution in the sugar more or less; in sixty-six the sugar was increased. Coignard emphasizes the fact that other matters must be regarded than the diminution in sugar in the urine, and that it is a mistake to judge of the progress of the case purely from this stand-point, and finally reminds us that with care a diabetic may live as long as a man in good health.

The *alkaline treatment*, associated with diet, was rapidly successful in a case of R. Jamin. ²⁴_{Aug. 26} The patient was enormously corpulent, of sedentary habits, born of rheumatic parents, herself subject to arthritic attacks of a painful nature, and with uric acid sediments. For two months, and during twenty days of each

month, she took five grammes (seventy-five grains) daily of sodium carbonate, dissolved in a litre of water and drunk during the day, together with an anti-diabetic diet. At the end of two months the symptoms had decidedly diminished, when she went to Vichy at the advice of her physician, but, returning soon again, resumed the alkaline treatment for six days, alternating with six days' intermission. Alkaline baths and exercise were also ordered. By October 8th there was no trace of sugar, and the general health of the patient was perfect. For eight months after this the anti-diabetic diet was persevered in, the patient taking four grammes (one drachm) of the bicarbonate of sodium for the first six days of each month, and after this from time to time she would take for six days three or four grammes (forty-five to sixty grains) of sodium carbonate. At the end of three years analysis showed the continued absence of sugar. This is, of course, the very sort of case in which we would expect the alkaline treatment to be of service—the uric acid, diabetic rheumatism, obesity, etc.

Louis Lewis¹⁸⁶_{Oct.} ascribes the origin of the *arsenic treatment* of diabetes to Salkowski, who discovered that the livers of animals poisoned by arsenic contained no glycogen, and that under such conditions no artificial diabetes can be produced, either by puncture of the fourth ventricle or curare.

W. D. Hamaker⁸⁰_{Mar.} reports a case treated with three grains (0.19 gramme) of *carbonate of lithium* and one-tenth grain (0.0065 gramme) of *arsenite of sodium* daily, dissolved in a quart of water, subsequently reduced to a pint, with strict diabetic diet for eight weeks. For one week before death there was apparent improvement, when suddenly there supervened diabetic coma, acetone appeared in the urine, and death promptly ensued.

At Bordeaux, where diabetes is said to be so common, the method by lithiated arsenical water described by Martineau¹⁰⁸_{May 15} has not been found to produce any appreciable benefit.

O. V. Korjensky reports¹⁰⁰_{Sept.} a case of diabetes cured by the use of *strychnia* in increasing doses, from the one-sixtieth to one-sixteenth per day. The sugar had fallen at the end of a month and decreased steadily during three months, when not a trace of glucose could be found in the urine. During the treatment the patient was allowed to eat everything except sugar and jellies. When examined a year later he was still quite well, and his urine

free from sugar. Strychnine was resorted to after the ordinary diabetic remedies had failed. It was thought by Dr. Korjensky to be indicated as a drug capable of stimulating innervation and augmenting the blood pressure, diabetes being, according to him, a disturbance of the general systemic metabolism, dependent upon some failure of innervation, with lowered arterial tension.

Jambul (*Syzygium jambolanum*) continues to be used for diabetes with varying results. It is a powder made of the bark and seeds of a small evergreen tree found in India, especially on the peninsula of Malacca. An infusion and fluid extract are also used. Favorable reports are given by W. H. Morse,¹⁰⁷ von Ledden Hulsebosch,²⁰² A. R. Allen, and Hemminger.²⁰² In the cases of Allen and Hemminger all foods containing sugar and starch were entirely eliminated from the diet, and the thirst was controlled as much as possible. The reduction in Hemminger's case was from fifteen pints maximum to four pints (two thousand grammes); specific gravity, 1044; sugar, thirty-two grains to the ounce. In Allen's case from sixteen pints to eight pints (eight to four thousand grammes); specific gravity, 1036, and sugar thirty grains to the ounce. The patients improved in looks and feeling. Unfavorable reports are furnished by Robert Birch.² The doses administered are six to eight drops of the fluid extract, three to five grains (0.19 to 0.32 gramme) of the powder, and four ounces (one hundred and twenty-four grammes) of the one to ten infusion.

J. A. Quanjer⁵⁸³ accidentally met a diabetic from India, who regarded his disease but lightly, because he considered that he had the glycosuria completely under control through a substance which he called *djoét*. Numerous examinations of his urine seemed to sustain this idea, and when he returned to India he sent to Dr. Quanjer a sample of the bark, which he ascertained to be from the *Syzygium jambolanum*. To a patient having 4.5 per cent. of sugar in his urine, Quanjer, on the 15th of September, gave an infusion, strength one to thirty, for two days, and at the same time ordered diabetic diet. On the 13th of October, the sugar was reduced to 0.7 of one per cent., and by the 9th of November there was a mere trace. According to an Indian physician, Banat-Vala, sugar gradually disappears under the use of jambul, even if amylaceous substances are taken; accordingly, Quanjer diminished the rigor of the diet, admitting potatoes and bread. In consequence, on December

14th, the glycosuria was 0.4 of 1 per cent., on the 19th 0.16 of 1 per cent.

H. Vandenberg,⁵⁸³ in a patient with 6 per cent. of glycosuria, reduced the sugar to $3\frac{1}{2}$ per cent. with five and nine quarts by diet only in the course of two weeks. Then he used the infusion of jambul, one to thirty, for four weeks, with the same diet, and the sugar was reduced to 2.39 per cent. with 3.69 litres (quarts) of water. A previous trace of albumen had increased, and the patient became more emaciated and died suddenly with paralysis of the heart. A second patient sixty-eight years old was uninfluenced by the same drug.

J. M. Coates Cole²_{Apr. 28} reports a case of absolute failure of jambul to relieve the symptoms, but, on the other hand, they were greatly relieved by codeine; indeed, in less than a fortnight of treatment by jambul the urine became more than treble in quantity, the specific gravity rose to 1035, and there were forty grains of sugar per day. The patient got intensely thirsty and extremely weak, but in spite of this Dr. Cole persevered as long as he possibly could with the jambul. After ten days of cessation from jambul and the resumption of codeine the patient became much stronger, passing five or six pints of urine a day, containing seventeen grains (1.13 grammes) per ounce of sugar and a specific gravity of 1030. The tablets of jambul were procured from a first-class London chemist.

Dujardin-Beaumetz, Huchard, and Robin have had some satisfactory results⁴⁶_{May 20} in the treatment of diabetes mellitus and diabetes insipidus by *antipyrin*. In the experience of Dujardin-Beaumetz, in three cases the urine fell from six to two litres (quarts), the proportion of sugar remaining the same in one case, while in another the sugar also fell. The omission of the antipyrin was followed by increase in the quantity of urine, the dose administered being from two to six grammes (thirty to ninety grains) per day. Robin produced a total disappearance with a dose of four grammes (one drachm). Huchard combined his treatment with the bicarbonate of sodium. All results were obtained without special regimen. The explanation suggested is that the drug acts as a regulator of the excitability of the medulla oblongata.

Huchard³_{Apr. 16} reported to the Société de Théraputique two cases of diabetes mellitus treated by antipyrin. One patient was passing

ten litres (quarts) of urine per day and eight hundred grammes (twenty-five ounces) of sugar. The first day under observation he passed 70.08 grammes per litre, or seven hundred and fifty-three grammes (twenty-three ounces) in the twenty-four hours, 96.32 grammes of urea per litre or eight hundred and ninety-six grammes (twenty-eight ounces) in the twenty-four hours. Thus he was both diabetic and azoturic at the same time. He received six grammes of antipyrin per day. At first there was no change, but on the fourth day the quantity of urine was reduced to 5.5 litres and the sugar to three hundred and three grammes, but the urea remained stationary. He diminished the dose of antipyrin the following day, but the quantity of urine did not increase, the patient passing four litres and five hundred grammes (nine pints), containing 271.08 grammes (eight and one-half ounces) of sugar. The quantity of urea remained at 63.76 grammes (two ounces). On the thirty-first day of March he suspended the antipyrin entirely, and the quantity of urine immediately increased to ten litres (twenty pints) daily, containing seven hundred and fifty-three grammes of sugar. Again six grains (0.39 gramme) of antipyrin were administered, associated with twelve grains (0.78 gramme) of sodium carbonate, to counteract certain gastric trouble. The urine again diminished in two days to four litres (eight pints), while the sugar fell to three hundred and seventy grammes (eleven ounces and six drachms). The patient was not on diabetic diet. At a previous meeting Dujardin-Beaumetz had reported three cases in which the sugar had disappeared entirely and the urine decreased to three litres (six pints) with a dose of two grammes (thirty grains), while M. A. Robin had also noted disappearance of sugar with doses of four grammes (one drachm) and a diabetic diet, but it was always attended with the appearance of albumen in the urine, the significance of which is yet to be determined.

M. Wolkow¹¹⁴³ used antipyrin in two cases of diabetes with advantage, while in two it produced only an inconvenient disposition to perspiration. He used one gramme (fifteen grains) three times a day. *Antifebrin* was useless. *Thallin sulphate* produced only for a short time a diminution in the sugar. *Phenacetin* also was without effect. On the other hand, *salol*, in doses of one gramme (twenty-five grains) four times a day, diminished the thirst as well as the excretion of sugar, urea, and uric acid to a consider-

able degree in one case. Wolkow explains the different effects by differences in the diabetes from an etiological stand-point, the effect being favorable if the disease depends on alterations in the central nervous system.

At the first meeting of the Egyptian Medical Society Dr. Hassan Pasha Mahmoud²⁶ reported favorably on the use of salol in diabetes mellitus in four cases, as to which it is not stated whether anti-diabetic diet was used. Dr. Grant also gave his experience with the treatment of such cases with salol and salol with opium. He noticed a marked amelioration in some cases, while in others the sugar would disappear entirely from the urine and not reappear until some annoyance happened to cause worry, when there was an immediate return of the malady. He desired to know if Hassan Pasha's cases were permanent recoveries or not, to which the latter replied that the four cases he referred to had never turned up again, so he considered he was justified in putting them before the Society as permanently cured.

Worms⁶ communicated to the Faculty of Medicine of Paris the result of his researches upon *saccharine* from a therapeutical and alimentary point of view. The entire quantity ingested was found in the urine, to which it communicated a sweet taste. He administered the drug in various forms, in doses of ten centigrammes (1.5 grains) per day, to four diabetics in different stages of the disease. Only one was able to bear it, who had been continuing it for the last two months, while the other three had to give it up, as it caused serious gastric trouble. In one of the three its employment was resumed after a month's suspension, and it caused identical troubles at the end of ten days, whence the writer concluded that there is a risk in introducing *saccharine* into the food of diabetics, and if used at all it should be with the greatest caution, one of the essential conditions in the treatment of these patients being to preserve intact their nutrition. Dujardin-Beaumont said that he had not noticed disadvantage in patients to whom he had administered *saccharine*, but thought that the accident above named might occur, and that *saccharine* may interfere with the digestive power of the pancreatic and gastric juices.

R. A. Kennedy¹³⁰ reported to the Montreal Medico-Chirurgical Society a case in which codeine was first given with benefit, but lost its effect in the second week. *Nitro-glycerine* was then

given and continued with slight intermission for five months. It is stated that its action was markedly beneficial, the patient's condition steadily improving. Strict diabetic diet was also, however, employed. At the time of the report the patient is quoted as perfectly well. Analysis of this case scarcely justifies the conclusion that the improvement should be ascribed to the nitro-glycerine. A strict diabetic diet was followed, and apparently the sugar did not disappear until two months after nitro-glycerine was discontinued, and at the time of its disappearance the patient was taking iron and strychnine, while she was taking no medicine whatever for a month previous to its final disappearance. A. Marcy, Jr., of Riverton, N. J., treated a case in the summer of 1887 with glycerine, but without satisfactory results. F. T. West Ford²⁸⁵_{Mar. 18} treated a case by *glycerine of glycerole*, but no particulars are given.

Dr. de Heune³⁰ says that *ergotin* used subcutaneously will cause a temporary and even permanent disappearance of glycosuria, polydipsia, polyuria, emaciation, and weakness of diabetes, all of which symptoms disappear in regular order, the polyuria and polydipsia after five to eight injections, the glycosuria after the second, disappearing after the tenth. Glycosuria reappears if the treatment be stopped too suddenly, but the disappearance is permanent after six or eight weeks' treatment. He injects six to ten drops, sometimes more, daily. He says, further, that by this treatment diabetics can be prepared for any surgical operation, particularly cataract.

Under the head of "Bizarre Treatment of Diabetes," Peyraud¹⁰⁸_{May 18} has recently reported to the Medical Society of Bordeaux the effect of *camphor*. First, in animals to which he administered it, he found neither sugar nor glycogen in the liver. In the treatment of diabetes he found a diminution of the amount of sugar and sometimes a total disappearance. Camphor was administered in the shape of oil from capsules containing 0.05 gramme ($\frac{1}{4}$ grain) three times a day. He also used the essence of absinthe, which has similar properties, in the shape of simple absinthe of commerce, in the dose of a glass a day. (The writer probably means a "glass of absinthe" as understood in France: about half-ounce absinthe and four ounces water, the latter being slowly poured on the former to obtain a milky solution.)

Schnée¹¹² includes *pilocarpine* and *mercurials* among the remedies recommended for the treatment of diabetes, in addition to opium, morphine, and codeine.

In an article on the treatment of "Diabetes in Infancy and Childhood," A. Jacobi⁵¹ Nov. says the treatment must be circumspect and energetic. Fortunately, the young are apt to live on milk, so that less difficulty is encountered in enforcing anti-diabetic diet. Milk, skimmed or not, forms a principal and beneficial part of the treatment. The medicinal treatment of the young requires some modification. The facility with which cerebral symptoms, coma, etc., are developed, renders the persistent use of alkalies advisable and forbids the use of opium. Iodoform, of use in doses of ten to twenty grains (0.65 to 1.29 grammes) daily in adults, is seldom tolerated in the young, even in proportionately small doses. Arsenic may be given in increasing doses a long time. The bromide as well as other preparations, one drop or more of Fowler's solution, largely diluted, three times daily after meals, the dose to be gradually increased until from two to four drops are reached. Salicylate of sodium with an alkaline beverage, Seltzer or Vichy, has a decidedly favorable effect. A child of five years can take from five to eight grains (0.32 to 0.52 gramme) three times a day, and continue its use for many weeks.

Treatment of Diabetic Coma.—Allusion was made in the ANNUAL of last year to the treatment suggested by Stadelmann of sodium carbonate, administered by the mouth and by enema or hypodermically. J. Hesse⁴ Nov. relates a case treated by transfusion into the veins of a 4 per cent. solution of sodium carbonate and subcutaneous injection of the same. The patient was forty-two years old and had been ill for a year. About a week after admission to hospital he fell into diabetic coma. The right vena basilica was opened and fifty cubic centimetres (one ounce and five drachms) of blood were allowed to escape and two hundred and fifty grammes (eight ounces) of a 4 per cent. solution of sodium carbonate injected. For some hours there seemed to be no indication of improvement. Gradually, however, the coma passed into quiet sleep, out of which the patient awoke in a few hours with a clear head. Twelve hours later somnolence again came on and two hundred grammes of the solution were injected into the left thigh, producing great pain during the prolonged injection. Im-

provement, however, followed, and the patient passed the following night awake, but died in the third attack.

C. Cooper Cripps¹⁸⁷_{July} suggests that as diabetic coma is probably due to some abnormal decomposition, and as there are grounds for believing that imperfect oxidation is the cause of decomposition in the tissues, recommends the use of oxygen by inhalation.

Treatment of Diabetic Gangrene.—In the discussion on Hunt's paper on "Diabetic Gangrene" read before the Philadelphia County Medical Society, T. G. Morton said⁹_{Dec. 22} the surgical treatment of this form of gangrene can generally be but palliative; most of the cases he has seen have been promptly fatal. The ordinary principles of surgical treatment should be observed; all tension of parts ought to be relieved by deep, free incisions, which, by relaxing and draining the tissues, permit a better circulation; indeed, he has often arrested the rapid march of gangrene by such treatment. When a line of demarcation forms, which may occasionally happen, the question of amputation may arise. Occasionally the gangrene of diabetes is associated with most excruciating pain, not only in the affected limb, but apparently in the gangrenous parts. He has had two such cases, both females, and in each he performed nerve section, with partial relief in one, and with complete success in the other. In the first he sectioned the posterior tibial, in the other the sciatic. The latter case he saw in consultation with the late L. M. Service, of Belmont, near the Falls of Schuylkill. The patient was seventy years of age. A large portion of the foot was already gangrenous; the pain in the foot and leg as far as the knee was excessive. He sectioned the sciatic in the middle of the thigh; the gangrene, which was not apparently hastened or influenced by the operation, very slowly extended for some weeks, until a point about four inches above the ankle was reached, where a line of demarcation formed. Subsequently, Dr. Service, Jr., removed all the gangrenous parts without encroaching upon the living tissue. The patient improved, was able to move about her room with comfort and with entire freedom from pain; eight months afterward she died from an attack of acute dysentery.

C. B. Nancrede said that the practical outcome of this discussion should be to lay down a rule not to undertake any serious operation unless the urine has been tested for sugar as well as for albumen. Since he assisted at an amputation of the breast in the

practice of a friend, in which the urine had been found free from albumen prior to operation, but after the amputation was found to be loaded with sugar, he has pursued this rule. Perhaps if the urinary examination included testing for sugar, as well as albumen, there would be fewer unexpectedly fatal terminations to operations and more cases of diabetes recognized.

John Ashhurst said, in regard to the recommendation to amputate at a very high point in cases of spontaneous gangrene, the general consensus of surgical opinion is against it. In traumatic gangrene, of course, the case is different. There the proper course is to amputate, as soon as possible, at a point well above the limit of the gangrenous portion.

Thomas S. K. Morton said that the system was especially unable to cope with the attacks of bacteria when diabetes is present, for then is provided, in addition to the other favorite pabula of bacteria, glucose, which, in tissue solution, affords a most capital medium for the culture and dissemination of poisonous and tissue-destroying micro-organisms. We must, then, have ever in mind that in dealing with surgical complications of any of the diseases which have been quoted, but more especially in the case of diabetes, our object should be:—

1. To prevent infection of a part about to become gangrenous, by instituting disinfection and subsequent protection; and, above and beyond all, never to apply a poultice.

2. Only to interfere surgically when absolutely necessary.

3. To operate only with thorough and powerful antiseptics—asepsis will never answer in these cases.

4. To relieve tension absolutely, and to eradicate as much of the diseased tissue as possible, and to disinfect thoroughly and to render sterile all that cannot be so treated; for unless this be accomplished, a favorable result, or arrest of the destructive process, cannot be expected.

5. In suturing or dressing, to make no great traction upon any portion of the wound or its surroundings, and to provide most liberally for drainage.

6. To dress the wound in such a way as to prohibit subsequent infection, and to redress it upon the slightest indication.

7. To remember that non-union and non-healing will prob-

ably result, but that we may be bold in doing what seems indicated, for local harm cannot come save by infection.

De Forest Willard could not agree with the suggestion to make incisions to relieve the tension. He considered any interference injudicious in slow gangrene. The only safe plan is to wait for the line of demarcation. Some months since, a man almost moribund came to the hospital with gangrene of the leg, and with crepitation extending as high as the hip-joint. Under excessive stimulation, twenty-four ounces of whisky daily, the patient rallied, and he cut away the parts with scissors through the knee-joint. A quick operation, or one near the part, would have caused death. Recovery has taken place, though a spot is now making its appearance on the toe of the remaining leg.

DIABETES INSIPIDUS.

Etiology.—Grancher¹⁰⁰_{Apr. 3} reports the case of a child of eight, whose parents presented neither nervous nor syphilitic lesions, who received a blow on its left temple at the end of June or beginning of July. There was momentary loss of consciousness, but followed by rapid recovery. The illness followed some time later. When at school the child was constantly asking to be allowed to go out. Accompanying the polyuria was also thirst and polyphagia. On admission to hospital the child was passing seven or eight litres (fourteen to sixteen pints) of urine in the twenty-four hours, clear, colorless, and with a specific gravity of 1003 to 1004. The appetite diminished slightly, and there was some emaciation, but apparently no loss of strength. Physical examination gave negative results. The urea equaled 1.2 grammes (eighteen grains) per litre, or ten grammes (one hundred and fifty-four grains) per day. There was, therefore, no azoturia. Of chlorides there were 0.70 gramme (eleven grains) and of phosphates 0.10 gramme (one and a half grains), and no peptone. There was, therefore, no chlorine diabetes, no phosphatic diabetes, and no peptonuria. The diabetes was simple.

In the same paper Grancher¹⁰⁰_{Apr. 3} enumerates some of the conditions found to be attended with diabetes insipidus, as tubercular meningitis, a case of which, in a child of four, is reported by Hagenbach; ³⁶⁶_{V. 19, 22} epilepsy and hereditary syphilis, a case of which, in a child of six, is reported ³⁶⁸_{V. 34, 79} by Demme, of Berne. In

the last case there was a polyuria of fifteen litres (thirty pints) per day, reduced to two under the influence of iodide of potassium and mercury, Demme having ascribed it to a gummy tumor. A. Weil²⁰_{v. 46, '94} describes a form of hereditary polyuria, extending over four generations and including ninety-three persons; twenty were cases of diabetes insipidus, twelve males and eleven females, of all ages. Simple polyuria also succeeds scarlatina and intermittent fever. A. Johanessen has reported a case in an infant who was bitten on the neck by a wood-beetle. The wound was followed by œdema and intense nervous manifestations.

Jacobi says⁵¹_{Nov.} that some cases appear to be of a hereditary character, while syphilitic and other brain lesions have been found to explain its occurrence. In one case of his it ceased after the removal of a *Tænia medio-canellata* in a girl of five years. It was accompanied by copious and constant salivation. Inveterate masturbation and incontinence appeared to be the cause in several children of from four to eight. It ceased gradually with the restoration of better habits and better general health.

In addition to the cases of diabetes insipidus in young children, above referred to, Julius Weiszbarth, of Buda-Pesth,⁶_{Apr. 14} reports a case in a girl of four and a half years where the daily quantity of urine was six to thirteen litres, specific gravity of 1002, but no abnormal constituents. The thirst was extreme and no medication had any effect. The child died of diphtheria, but before death the quantity of urine diminished, as did also the thirst.

The autopsy discovered slight œdema of the medulla oblongata, diphtheria of the nares and fauces, and strumous disease of the mediastinal glands, tuberculosis of the lungs, bronchial congestion, hypertrophy and induration of the liver, chronic catarrh of the stomach, follicular enteritis of the large intestine, hypertrophy of the muscular walls of the bladder, and dilatation of the ureters.

Symptomatology.—Krause³¹⁹_{July 21} recently published the results of some experiments upon a case of this affection and upon a healthy man, bearing on the symptomatology of this disease. It was noted that in the diabetic the ingestion of a large quantity of water was followed by a relatively large discharge of urine in the first hour after ingestion, contrary to the older views, while after this the amount of urine sank suddenly; while the healthy man, in

whom the urine never amounted to as much during the same hour as in the polyuric, secreted a proportionally large amount in the equalizing period. The effect of administration of water at shorter intervals was that both the healthy man and the diabetic passed increased quantities of urine. It was noted also that the diabetic passed no more water than he ingested.

Treatment.—As to treatment, Jacobi says⁵¹ that *valerianate of zinc*, *bromides*, *salicylate of sodium*, and *galvanization of the head* have proved unsatisfactory in his hands, but he has seen good results and sometimes a speedy improvement on the administration of *ergot* and *atropia*. A child of five may take daily a half a drachm of the fluid extract of ergot and of atropia 0.01 of a grain (0.00065 gramme). More reliable than either is *strychnia* in three daily doses of 0.01 of a grain (0.00065 gramme) or more.

A. Libby¹⁰⁰ reports a case of successful treatment of diabetes insipidus, wherein the patient was passing from twelve to twenty-four quarts of water in twenty-four hours, by *spirits of turpentine*, fifteen to twenty drops three times a day.

Laplane¹⁵¹ treated with *antipyrin* a man who gave no history of alcoholism, malaria, or syphilis, and was otherwise well, but thin. In December, 1887, he was struck in the occiput by the corner of a heavy case. A few days after he began to be thirsty, passed large quantities of urine, and lost flesh and strength rapidly. On admission to hospital he was passing thirteen quarts of urine per day, containing nearly two ounces (sixty-two grammes) of urea. He weighed only ninety-four pounds. Under the use of extract of *valerian*, two drachms a day (7.77 grammes), the water fell to ten quarts, containing a little over 1.7 ounces (forty-nine grammes) of urea. The patient also gained two pounds in weight. Hypodermic injections of *arsenic* and *strychnia*, one-thirtieth of a grain (0.0018 gramme) a day, produced no further change in the urine, but augmented the weight by two and one-half pounds. In March this treatment was substituted by antipyrin, fifteen grains (one gramme) three times a day. At the end of the week the urine had diminished to seven quarts, the urea to one and one-half ounces (forty-six grammes), while the weight had increased three pounds. A few days later the patient was passing five and one-half quarts of water containing only five grammes (seventy-five grains) of urea. He gained much strength and insisted

on leaving the hospital, although passing from five to six quarts of water daily.

Eichhorst⁹_{Aug. 11} also reports a case of diabetes insipidus in which three gallons and a half of urine were daily passed, the amount being permanently reduced to the normal by the exhibition of seventy-five grains (4.9 grammes) of antipyrin daily.

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